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FURTHER EVIDENCE ON THE VALIDITY OF PERSONALITY INVENTORIES[1]

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Counselors, guidance officers and personnel directors need objective evidence of an individual's social and emotional adjustment within himself and to his environment. There are many instruments which purport to measure quantitatively the extent of this adjustment, but as yet none of these instruments have proved highly valid in practice. In general, these personality inventories consist of a series of questions or statements of activities or attitudes, to which the individual reacts. In the interpretation of these instruments the questions are assigned to various categories and the score obtained is supposed to represent a measure of the adjustment in these categories; they usually are such as emotional, personal, social, home, health and others.

It is the purpose of this paper to report findings concerning the validity and prognostic value of two of these instruments. The Adjustment Inventory, student form, 1934 edition, by Hugh M. Bell; and the Social Adjustment Inventory, Sapich edition, 1939, by John N. Washburne. The scores obtained by entering students at the Rochester Athenaeum and Mechanics Institute were computed for the several categories and totals of these inventories and scores were compared with Institute faculty ratings of these students. The validity of faculty judgment was checked by counselors, who made independent ratings of student adjustment. It was hoped that the validity and prognostic value of these inventories would be indicated by correlation between faculty ratings and inventory scores insofar as these scores predicted personality traits of students in school situations.

[1] This article is in part an abstract of a thesis presented in partial fulfillment of the requirements for the master of art's degree at the University of Rochester. This investigation was made under the direction of Dr. Jack W. Dunlap.

PROCEDURE

The basic data were obtained from the scores made by one hundred thirty-eight freshmen who entered the Institute in September, 1939. In order to obtain a fair sample of the entering population, the students were selected as follows from six departments: Thirteen men from the Mechanical, twelve from the Photographic Technology, seventeen from Publishing and Printing, thirty-three from Chemistry, and thirty-seven women from Food Administration. The average age at the time of administration of the inventories was nineteen years, the youngest being seventeen and the oldest twenty-five.

The Washburne Inventory was administered to the students as part of the entrance requirements in September, 1939, and the Bell Inventory was administered especially for this study during October, 1939. So as to serve as a criterion with which the scores of these students might be compared, members of the Institute faculty were asked to rate the students on various aspects indicative of social, emotional and personal adjustment.

FACULTY RATINGS

In order to prepare this rating scale a study was made of thirty scales in common use by colleges. From these about three hundred trait names were gathered, and upon examination it appeared that they could be grouped into ten general categories which were similar to the traits indicated in the Bell and Washburne inventories. The names that were assigned to these categories for use in this investigation were: Promptness, leadership, courteousness, interest in opposite sex, sympathy and altruism, friendliness, cheerfulness, calmness, perseverance and energy. Since previous investigators have discovered that raters tend to use only three points on any larger scale, each of these traits was arranged on a three-point scale indicating good, average and poor adjustment. For example, the statements concerning promptness were: "prompt for appointment and in meeting obligations," "usually prompt," and "often late."

The faculty rated the students in January and February, 1940, and only those having students in class were requested to rate them. Under the individualized system of instruction in use at the Rochester Athenaeum and Mechanics Institute, the instructors are encouraged to consult with and observe each student and make tentative judgments concerning his or her emotional and social adjustment. These

observations are then recorded periodically in the Anecdotal Behavior Journal. This policy of observing, interpreting and recording significant items of student behavior has undoubtedly assisted the faculty as a group to become more sensitive to students as growing, dynamic beings than is the case in most college faculties. In addition to faculty observations the Behavior Journal brings together the following: Incidents regarding student behavior noted by advisers of student activities; employer's reports on student's adjustment to coöperative work; summary of conferences held with students; and periodic syntheses of individual adjustments and personal needs as revealed by the continuous picture obtained from the Journal.

In all, five faculty members rated each student, and the means of these ratings were computed, correct to one decimal place. As single numbers were desirable for use on the Hollerith tabulating equipment, these averages were transposed to whole numbers and punched on cards. Correlations were then computed, using the scores of the one hundred thirty-eight individuals on the Bell, Washburne and faculty ratings.

The reliability of faculty ratings was determined by averaging the ratings of part of the faculty members and correlating these with the average ratings of the other members. The reliability coefficients ranged from .47 for the department having the greatest number of student to .91 for another department with fewer students.

VALIDATION OF FACULTY RATINGS BY COUNSELORS

After the correlations between the faculty ratings and the inventories had been computed and found to indicate low relationships, a verification of the faculty ratings was undertaken. In January, 1941, the department heads, who are responsible for the counseling of students in their departments, were asked to rate those students who had entered in September, 1939.

The administrative organization of the Institute is such that the student-counselor relation is extremely close. In only one of the six departments under consideration did the number of students enrolled exceed one hundred and in the department where the enrollment exceeded this figure an assistant took care of routine duties in order that the counseling procedures might be more effective. The counselor has at his command a considerable body of information, extending from results of personal interviews and classification examinations to the relatively comprehensive Behavior Journal noted in the fore-

going paragraphs. Stress is placed upon the wealth of material available to the counselor because it is believed that counselor's estimates of the degree to which students are adjusted or maladjusted may be expected to possess considerable validity.

The definitions which counselors were asked to utilize in rating students were similar to those employed by Washburne[1] in his investigation: Namely, "The coöperative, happy person who seemed to be dealing effectively with his environment was counted well-adjusted; the uncoöperative, discontented, disorderly, estranged person or one who seemed to be unable either to alter his environment or to adapt himself to it was counted maladjusted."

Two approaches were used in having the counselors make the ratings. In the first approach, they were asked to name the students whom they considered to be the best adjusted and also those who were the poorest adjusted. The scores of these selected students on the Bell and Washburne inventories were compared with the counselor's ratings. In the second approach, all of the students scoring well adjusted or better on the total adjustment categories of both inventories were rated by the department heads. Likewise, the students who had obtained scores indicative of below normal or poor adjustment were rated. In neither case were the counselors allowed to know the inventory scores prior to their ratings.

The correlations were computed from the raw scores of one hundred thirty-eight individuals on the Bell, Washburne and faculty ratings by means of Hollerith equipment and calculating machines. All of the calculations and correlations were checked by making the necessary computations a second time.

The correlations between faculty ratings and Bell and Washburne scores, shown in Tables I and II, are, in general, quite low. The correlations between the several parts and the total of the Bell and the parts, subtotals and totals of the faculty ratings range from $-.319$ (between Bell Social and faculty rating of interest in opposite sex) to .165 (between Bell Health and faculty rating of leadership). Total adjustment on the Bell shows no relationship to faculty judgment of adjustment as this correlation is $+.003$.

Although the faculty rated traits do not have the same names as the subtests of either of the inventories, the first six traits on the rating

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[1] Washburne, John N.: *Washburne Social-Adjustment Inventory. Manual for Interpreting*, 1940, p. 11.

scale were grouped in the hope they would give an indication of social adjustment and the last four totaled to indicate emotional adjustment. However, the faculty ratings which were totaled to indicate social adjustment resulted in a correlation with Bell Social scores of −.115, and the relationship between faculty ratings of emotional adjustment and Bell Emotional scores was −.085. It is obvious from these correlations that the scores received by students on the social, emotional and total of the Bell Inventory give no indication of adjustment insofar as these are compared with faculty ratings of student adjustment as observed in classroom situations.

TABLE I.—CORRELATIONS OF BELL ADJUSTMENT INVENTORY SCORES AND FACULTY RATINGS OF STUDENT ADJUSTMENT

Faculty ratings	Bell Adjustment Inventory				
	Home	Health	Social	Emotional	Total
Social					
Promptness	.041[1]	.026	−.282	−.225	−.123
Leadership	−.036[1]	.165	.131	.045	.101
Courtesy	.094	.088	−.089	−.176	−.032
Sex interest	.026	.071	−.319	−.080	−.152
Sympathy	.051	−.124	−.051	−.225	−.026
Friendliness	−.030	.007	.039	−.091	−.011
Emotional					
Cheerfulness	.058	−.039	−.054	−.203	.004
Calmness	.006	.155	−.178	.032	−.069
Perserverence	−.046	.013	−.145	−.123	−.078
Energy	.120	.061	−.126	−.083	−.046
Total social	.034	.030	−.115	−.173	−.048
Total emotional	.094	.057	−.126	−.085	−.017
Total	.095	.097	−.114	−.116	−.003

[1] It should be noted that since a low score on the Bell Adjustment Inventory or the Washburne Social Adjustment Inventory is indicative of good adjustment, the faculty rating blanks were so constructed that low ratings likewise indicated good adjustment. Consequently, positive correlations indicate the extent of agreement between faculty ratings of student adjustment on various traits and scores made on the inventories. Low or zero correlations indicate lack of agreement. Negative correlations signify that a trait recognized as present by the faculty is lacking as indicated by the student's score on the Inventory.

The correlations shown in Table II computed between the several sections of the Washburne and the parts, subtotals and totals of the

faculty ratings range from −.298 (between Washburne Truthfulness scores and faculty estimate of courtesy) to .348 (between Washburne Sympathy and faculty judgment of Sympathy).

TABLE II.—CORRELATION OF WASHBURNE SOCIAL ADJUSTMENT INVENTORY SCORES AND FACULTY RATINGS OF STUDENT ADJUSTMENT

Faculty ratings	Washburne Social Adjustment Inventory							
	Truth	Sympathy	Alienation	Purpose	Impulse judgment	Control	Happiness	Total
Social								
Promptness	−.207	.156	.080	.029	.002	.162	.102	−.019
Leadership	−.087	.197	.148	.083	.043	.172	.194	.073
Courtesy	−.298	.207	.148	.173	.044	.225	.182	.037
Sex interest	.018	.166	−.030	−.069	−.069	.176	.036	.034
Sympathy	−.296	.348	.150	.201	−.033	.208	.284	.146
Friendliness	−.151	.167	.086	.114	−.027	.106	.288	.078
Emotional								
Cheerfulness	−.225	.177	.027	.118	.008	.142	.149	−.031
Calmness	−.022	.067	.022	.039	.129	.060	.020	.013
Perserverence	−.151	.165	.104	.036	.069	.162	.148	.058
Energy	−.166	.134	.032	.046	.101	.104	.100	−.038
Total social	−.280	.253	.132	.158	.270	.288	.251	.075
Total emotional	−.209	.188	.082	.096	.136	.188	.156	.014
Total	−.210	.256	.132	.101	.031	.241	.210	.051

Many more of the correlations between Washburne and faculty ratings are positive (ninety-two out of one hundred twelve or eighty-two per cent) than is the case between the Bell and the faculty ratings (twenty-seven out of sixty-five or forty-two per cent) even though all of the positive correlations are so low as to invalidate them for individual prognostic purposes.

The intercorrelations among the various sections of each inventory are shown in Tables III and IV. The relationships among the five scores of the Bell subtests and totals ranged from .026 to .642. These are similar to, but lower than, those found by Bell.[1]

Intercorrelations among the various sections and total of the Washburne vary from −.399 to .609. The relationships exhibited

[1] Bell, Hugh M.: *Manual for Adjustment Inventory.* 1934, p. 3.

here do not lend support to Washburne's statement[1] that happiness, alienation and sympathy (the *HAS* section of this inventory) have something in common exclusive of purpose, impulse-judgment and control (the *PIC* section of the inventory). For example, alienation has about the same relationship to control as it does to happiness

TABLE III.—INTERCORRELATIONS OF BELL ADJUSTMENT INVENTORY

Bell Adjustment Inventory	Bell Adjustment Inventory			
	Home	Health	Social	Emotional
Health	.295			
Social	.163	.026		
Emotional	.274	.332	.384	
Total	.625	.414	.639	.642

(.336 as against .391), and purpose likewise has about the same relationship to control as to happiness (.387 as against .374). In other words, there is no very distinct common factor which excludes any other as evidenced by these intercorrelations.

TABLE IV.—INTERCORRELATIONS OF WASHBURNE SOCIAL ADJUSTMENT INVENTORY

Washburne Social Adjustment Inventory	Washburne Social Adjustment Inventory							
	Truth	Sympathy	Alienation	Purpose	Impulse judgment	Control	Happiness	Total
Truth	....	.204	−.291	−.399	.002	.308	−.300	.077
Sympathy	....	....	.132	.332	.022	.098	.345	.400
Alienation	....	....	.....	.241	.108	.366	.391	.463
Purpose	....	....	.....	.....	.161	.387	.374	.494
Impulse judgment	....	....	.....	.....	....	.208	.159	.306
Control	....	....	.....	.....	....	....	.433	.609
Happiness	....	....	.....	.....	....	....	....	.480

Faculty ratings for the ten traits included on the blank show intercorrelations ranging from .043 to .789 with a median of .428 (not shown

[1] Washburne, John N.: *Washburne Social Adjust. Inventory. Manual for Interpreting*, 1940, p. 20.

in the tables). These comparatively high intercorrelations indicate a tendency on the part of the faculty to rate students somewhat the same for all traits and is a halo effect commonly noted when rating blanks are employed.

Regardless of the lack of relationship which was evidenced between faculty ratings and these two inventories, it might be expected that the various parts or the totals of the Bell and Washburne would, if valid indicators of adjustment, correlate rather highly. However, Table V indicates that the correlations range from −.250 (Bell Home Adjustment and Washburne Truthfulness) to .414 (Bell Total and Washburne Alienation). The total scores show a correlation of only .288. This would lead one to infer that these two inven-

TABLE V.—CORRELATIONS OF BELL ADJUSTMENT INVENTORY AND WASHBURNE SOCIAL ADJUSTMENT INVENTORY

Washburne Social Adjustment Inventory	Bell Adjustment Inventory				
	Home	Health	Social	Emotional	Total
Truth	−.250	−.096	−.002	.025	−.177
Sympathy	.036	.050	.168	−.183	.048
Alienation	.256	.084	.321	.233	.414
Purpose	.288	.052	.161	.094	.250
Impulse judgment	.127	.073	.085	.111	.197
Control	.146	.126	.000	.173	.206
Happiness	.267	.122	.228	.179	.334
Total	.153	.034	.240	.102	.288

tories are not measuring the same thing, and, if faculty ratings based upon observation of students in classroom situations are to be considered as a criterion, neither of the inventories is measuring student adjustment.

When the counselor's ratings were compiled it was found that they had selected a total of twenty-one out of the one hundred thirty-eight individuals in this study as being well-adjusted and a total of eighteen as being poorly adjusted. Table VI shows the status of the thirty-nine students selected when classified by Bell's descriptive designations. An inspection of this table indicates that there is no general agreement between the Bell Inventory scores and the counselor's ratings and that these ratings could not be cited in support of any validity claims for the Bell. The bi-serial correlation with Sheppard's correction applied

was only .086 between the quality of adjustment as indicated by the Bell and the counselor's rating.

TABLE VI.—COUNSELOR'S RATINGS OF STUDENT ADJUSTMENT COMPARED WITH STUDENT'S BELL ADJUSTMENT INVENTORY SOCIAL, EMOTIONAL AND TOTAL SCORES

	Twenty-one students rated well-adjusted by counselors	Eighteen students rated poorly-adjusted by counselors
Bell Social		
Excellent	..	7
Good	4	1
Average	12	5
Unsatisfactory	3	5
Very satisfactory	2	
	21	18
Bell Emotional		
Excellent	1	6
Good	9	2
Average	7	8
Unsatisfactory	2	2
Very unsatisfactory	2	
	21	18
Bell Total		
Excellent		
Good	7	5
Average	7	7
Unsatisfactory	7	5
Very unsatisfactory	..	1
	21	18

Table VII shows the status of these same thirty-nine students when grouped according to the Washburne total score ratings. An inspection of this table indicates very little agreement between the Washburne scores and counselor's ratings. In fact, the bi-serial "*r*" with Sheppard's correction applied is only .026, which indicates that this inventory is not valid as a predictor of student adjustment in this institution.

As another approach to the counselor rating study all of the students scoring above and all the students scoring below average on

TABLE VII.—COUNSELOR'S RATINGS OF STUDENT ADJUSTMENT COMPARED WITH STUDENT'S WASHBURNE SOCIAL ADJUSTMENT INVENTORY SCORES

Total Washburne scores	Twenty-one students rated well-adjusted by counselors	Eighteen students rated poorly-adjusted by counselors
Excellent		
Superior		
Well adjusted	5	1
Normal	13	12
Low normal	2	5
Border line	1	
Maladjusted		

the Bell and Washburne Inventories were rated by the department heads who had no knowledge of the inventory scores. The results of these ratings are shown in Table VIII. An examination of this table shows, as has already been indicated by Tables VI and VII, that the counselor ratings do not check the validity of either the Bell or the Washburne inventories.

TABLE VIII.—COUNSELOR'S RATINGS FOR STUDENTS SCORING ABOVE OR BELOW NORMAL ON BELL AND WASHBURNE ADJUSTMENT INVENTORIES

Counselor ratings	Students with Bell score		Students with Washburne score	
	Above average	Below average	Above normal	Below normal
Well-adjusted	1	1	1	2
Average	6	2	13	9
Poorly-adjusted	2	1	..	2

The ratings of the counselors verified in every case the faculty ratings; that is, students rated above average by department heads were also rated above average by the faculty, and those rated below average by the department heads were likewise rated below average by the faculty.

SUMMARY

This study has investigated the validity and prognostic value of the Bell Adjustment Inventory, 1934 edition, and the Washburne

Social Adjustment Inventory, 1939 edition. The validity has been determined by comparing the scores made by one hundred thirty-eight students on these inventories with Institute faculty ratings of these students on traits similar to the several sections of the inventories. The correlations between the Bell Inventory and faculty rating of adjustment varied from −.319 to .165. Correlations between the Washburne Inventory and faculty ratings varies from −.298 to .348. Additional justification for the use of faculty ratings as criteria for measuring the validity of these inventories was obtained by securing independent ratings by the department heads.

There are several weaknesses in this study of which the authors are well aware: (1) The number of cases, one hundred thirty-eight, is perhaps too few upon which to base sweeping generalizations; (2) faculty ratings are subject to several inaccuracies, such as, rating students who are noisy, restless and aggressive as poorly adjusted when it may be the quiet, retiring individual who would be considered as poorly adjusted by mental hygienists. In addition, faculty members tend to be generous and overrate students' qualities; (3) scores made by sophisticated students on paper and pencil personality inventories may be quite fictitious and thus present a false picture of their traits; (4) there may be hidden or suppressed adjustments or maladjustments which show in the inventory scores but are not visible in day-to-day classroom situations.

All of the above reasons probably contribute to the low correlations between the several methods of rating and the inventory scores. It may well be that such inventories as have been used in this study should be interpreted by trained psychologists. It is possible that with a larger sampling and interpretations by specially trained psychologists or clinicians the conclusions that these two inventories are not valid predictors of student adjustment would be modified. A further study based on case studies of students who have been selected by a specialist trained in the interpretation of inventory responses is desirable and is being undertaken as another measurement of validity. In conclusion, however, the results of the present study indicate that the Bell Adjustment Inventory and the Washburne Social Adjustment Inventory are not valid indicators of student adjustment in school situations such as prevail at Rochester Athenaeum and Mechanics Institute.

EDUCATIONAL ABILITY PATTERNS

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If the essential characteristics of students who prove to be successful in the various curricula of the college could be determined at the beginning of their collegiate careers, and if freshmen in search of an appropriate professional or occupational goal could be measured for these same characteristics, the college counselor would be able to determine the "educational ability" of the student with more scientific accuracy and objectivity than is possible in the present state of student personnel research. It is the purpose of this paper to demonstrate the application of a method for determining the measured characteristics or "educational ability patterns" of freshmen students who are subsequently successful in graduating from the various curricula of the colleges. This study represents one of several investigations in a systematic research program being carried on by staff members of the University of Minnesota Testing Bureau.

The concept of matching an individual's pattern of measured characteristics against group patterns is not new. Trabue[6] and Dvorak and Paterson[2] have contributed pioneer research on "occupational ability patterns," presenting evidence regarding the measured characteristics of adults employed in different occupations. Stead, Shartle, Dvorak and others of the Occupational Research Program of the United States Employment Service[4] have added considerably to our knowledge of the measured characteristics of persons employed on the job. Strong[5] has furnished us with significant patterns of "likes" and "dislikes" typical of men and women successfully employed in different occupations. The Committee on Educational Testing of the American Council on Education[1] and others have presented data showing the measured academic achievement of different professional goal groups in college. Williamson[7] has illustrated a method for deriving aptitude norms by presenting the freshman college aptitude test percentiles for various curricular groups of students who subsequently "survived" academic competition until the senior year.

Ideally it would be desirable to know the requisite educational as well as the occupational ability pattern as the two are not necessarily the same in all cases. The educational program sometimes constitutes a different type of hurdle in terms of amount and kind of

abilities than the occupation itself. The requirements for success in professional and vocational schools are often not the same as the requirements for success in the occupation. For example, the student of medical technology in the university probably needs to possess a greater degree of general academic intelligence and mathematical and scientific aptitude than the typical medical technologist on the job.

"Educational ability patterns" based on achievement acquired in the latter years of college are not as helpful in guiding the prospective student as are patterns based on the pre-college achievement of freshmen who are subsequently successful in following different curricular specializations. Such patterns would show the characteristic intellectual and informational equipment with which subsequently successful students entered upon their differentiated professional training programs.

If the present paper makes any contribution to student personnel research it will be one of method rather than of content. The results presented have been determined upon small groups of cases in various curricula, thus requiring the use of small sample statistical techniques to determine the significance of group differences. Furthermore, they have been calculated upon students of only one entering class. Further research on similar curricular groups for other years should be conducted before generalizing from the data presented. The small samples may not yield stable results. Despite these and other limitations the technique seems to be a promising one in a field where basic personnel research has been so meager.

This investigation has involved following up students who entered the College of Science, Literature and Arts of the University of Minnesota in the Fall of 1935 and graduated at the end of the Spring quarter of 1939 from the Colleges of Science, Literature and the Arts, Education, or the School of Business Administration. Students entering the College of Science, Literature and the Arts in 1935 were required to take a large battery of academic aptitude and achievement tests. We have consulted the graduating lists for these three colleges four years after the 1935 class had entered and determined the scores of these graduating seniors on tests administered when they entered the University in 1935. By classifying the names according to college and major curriculum from which they graduated, it has been possible to investigate the question as to whether the relative strengths of learned materials at the beginning of the collegiate career are indicative of the educational road the student will travel successfully for four years.

There were eight hundred twenty-seven students entering the College of Science, Literature and the Arts in the Fall of 1935 who took the complete battery of tests. Many of these freshmen dropped out of school prior to June, 1939. Some remained in that college. Others transferred to other colleges, especially to the College of Education and the School of Business Administration. A large mortality is typical of registration in the College of Science, Literature and the Arts which serves as a pre-professional school for the other colleges and schools of the University. This investigation is limited to the study of entrance test results for students who graduated from these three colleges at the end of the normal four-year program or who were registered in their fourth college year in the law, medical or dentistry schools. The tests administered to these freshmen in September, 1935, and used in this study are listed in Table I. In addition to these tests one other measure of scholastic aptitude was used, the high-school percentile rank, which is calculated on grades received in high school from the freshman year to the last semester of the senior year.

TABLE I.—TESTS ADMINISTERED TO FRESHMEN IN SEPTEMBER, 1935, AND USED IN THIS STUDY

TEST	FORM
American Council on Education Psychological Examination	1935
Coöperative English test	1933
Coöperative English test—vocabulary section	1933
Coöperative Literary Acquaintance test	1934
Coöperative Contemporary Affairs test	1934
Coöperative General Mathematics test	1934
Coöperative General Science test	1934

After checking the lists of 1939 graduates from these three colleges only one hundred ninety of the freshmen entering the College of Science, Literature and Arts in September, 1935, were found. Sixty-seven were graduated from the College of Science, Literature and the Arts, forty-nine from the School of Business Administration and forty-five from the College of Education, and others were registered in the schools of law, medicine and dentistry. The remainder had transferred to other schools or had dropped out. The number of drop-outs suggested by these figures is not surprising in the light of studies of student mortality. Table II shows the number of students who entered Science, Literature and the Arts in 1935, and who graduated from one of these three colleges, classified according to their college and the major department from which they graduated in June, 1939.

It will be seen that many of the groups are extremely small. To determine the significance of differences in measured characteristics for these groups small sample analysis was considered and Fisher's analysis of variance was employed. It must be remembered that the results of this type of analysis are presented in terms of probability and that a probability of .01 with a group of two is just as significant as a probability of .01 with a group of two thousand. The failure to realize this causes many investigators to discard data from small samples and

TABLE II.—NUMBER OF 1935 FRESHMEN GRADUATING IN 1939 FROM THE VARIOUS DEPARTMENTS OF THE THREE SELECTED COLLEGES

Science, Literature and the Arts

MAJOR	NUMBER
Journalism	11
Sociology and social work	9
Library science	7
Natural science (zoology, botany, and biology)	6
Pre-medicine	5
Psychology	4
Social science (economics, political science)	4
English and composition	4
Diplomatic and consular service	3
Liberal arts and philosophy	3
History	3
Romance languages (including German)	2
Music	2
Speech	1
Astronomy and mathematics	1
Fine arts	1
Classics and Latin	1
	67

Business Administration

Accounting	16
Merchandising	10
General business	5
Secretarial	5
Personnel	4
Finance	3
Industrial administration	1
Insurance	1
Office management	1
Statistics	1
Advertising	1
Department store management	1
	49

TABLE II.—NUMBER OF 1935 FRESHMEN GRADUATING IN 1935 FROM THE VARIOUS DEPARTMENTS OF THE THREE SELECTED COLLEGES—(*Continued*)

College of Education

MAJOR	NUMBER
English and composition	11
History	6
Elementary education	6
Music education	4
Physical education	3
Commercial education	3
Romance languages	3
Speech	3
Mathematics	2
Natural science	1
Library science	1
Art	1
Classics and Latin	1
	45

results in the loss of much valuable information contained in data that can be analyzed with small sample techniques. The small sample methods should be used with an awareness that all discovered differences may be of real significance. Our statistical errors will be of the second kind, as Fisher classifies them. We are not in danger of accepting false hypotheses, but we may reject true ones. We must be on our guard here and be quick to pick up clues of possible significance, and to follow them up in future research.

The scores on all the tests for all students in each group and in each college were tabulated. The analysis of variance was then made for the larger groups ($N = 4$ or 5 or more) in each of the colleges. That is, it was determined if each of the tests would differentiate among the curricular groups within the College of Science, Literature and the Arts, among the groups within the College of Education and among the groups within the School of Business Administration. The results of this analysis are presented below.

The American Council on Education Psychological Examination differentiated only among the groups in the College of Education. Here the probability that the differences are significant is greater than ninety-nine out of one hundred. There seem to be two quite separate groups in the College of Education at the University of Minnesota. One group, that with an academic major, is only slightly lower in scholastic ability than the students in the College of Science, Literature

and the Arts. The other group, that with a non-academic major, is much lower in scholastic ability.

The vocabulary section of the Coöperative English test differentiated significantly among the groups of five or more in the College of Science, Literature and the Arts and among the groups of four or more in the College of Education. The probabilities of these *F* values being due to chance lay between the one and the five per cent points.

The Coöperative English test differentiated among the major groups of five or more in Science, Literature and the Arts, and among the groups in Education. The *F* value for the Science, Literature and the Arts college was less than that for the one per cent point while the others lay between the one and the five per cent points.

The Coöperative Contemporary Affairs test differentiated among the groups in the College of Science, Literature and the Arts (between one and five per cent point) and among the groups of four or more in the College of Education (between the one and five per cent point).

The Coöperative Literary Acquaintance test differentiated among the groups of four or more in the School of Business Administration and among the groups of the same size in the College of Education. In both cases the probability value lay between the one and five per cent points.

The Coöperative General Mathematics test differentiated among the groups in the College of Education (between one per cent and five per cent point). The Coöperative General Science test differentiated among groups of five or more in Science, Literature and the Arts and the probability value was less than .01.

For some reason, only the groups in the School of Business Administration were differentiated on the basis of their high-school percentile. The probability was less than .01 and no other groups were differentiated at all by this variable. Table III presents these results in summary form.

These results of the analysis of variance indicate that all of these measures have some differentiating power. When the tests are given to students as freshmen, they differentiate them when they are grouped according to their curricula as graduating seniors four years later.

The analysis reported above was done for curricular groupings within each of the three colleges considered separately. A still further analysis of variance was calculated for each of the tests, including together all curricular groupings regardless of college. Whereas the first analysis was made for curricular groups within each of the three

colleges taken separately, the second analysis was concerned with determining the significance of group differences among the various curricula without respect to the college. This second analysis revealed significant differences (below five per cent point) for all measures except the high-school percentile rank. Senior curricular groupings were significantly differentiated in freshman tests in every measurement except high-school scholarship.

TABLE III.—DIFFERENTIATING POWERS OF VARIOUS TESTS AMONG THE GROUPS IN THE THREE COLLEGES

Test	Science, Literature and the Arts (groups of 5 or more)	Business (groups of 4 or more)	Education (groups of 4 or more)
American Council on Education Psychological Examination	..	..	†
Coöperative English—vocabulary	*	..	*
Coöperative English—total	†	..	*
High-school percentile	..	†	
Coöperative Contemporary Affairs	*	..	*
Coöperative Literary Acquaintance	..	*	*
Coöperative General Mathematics	..	..	*
Coöperative General Science	†		

* Probability value between one and five per cent point.

† Probability value less than one per cent point.

After analyzing the variances of test scores for these curricular groups and determining statistically that there were real differences in test performance among them at the freshman year before they had embarked upon the major field in which they were to concentrate, the data were presented graphically as "educational ability patterns." This involved calculations of mean test scores on each test for each of the curricular groups. (See Table IV.) These mean scores were then referred to percentile tables which were compiled for each test on the total eight hundred twenty-seven Science, Literature and the Arts freshmen. The percentile equivalents as given in Table IV indicate the percentage of the total eight hundred twenty-seven Science, Literature and the Arts freshmen who took all of the tests in 1935 and who made scores lower than the average score for the group who, four years later, became differentiated according to the major chosen.

TABLE IV.—MEAN SCORES AND THEIR PERCENTILE EQUIVALENTS* ON TESTS ADMINISTERED TO SCIENCE, LITERATURE AND THE ARTS FRESHMEN IN 1935 WHO WERE GRADUATED FROM THE FOLLOWING COLLEGES AND CURRICULA IN 1939

College	Curriculum	High School Percentile			American Council on Education		English		Literature		Contemporary Affairs		Mathematics		Science	
		N	*M*	Percentile	*M*	Percentile	*M*	Percentile	*M*	Percentile	*M*	Percentile	*M*	Percentile	*M*	Percentile
Science, Literature and the Arts	Total	67	85	64	235	72	185	69	66	77	125	73	36	59	63	61
	Library Science	7	84	62	223	62	211	89	70	81	114	64	26	32	59	55
	Sociology	9	87	68	211	56	169	55	54	57	97	47	27	34	44	30
	Journalism	11	83	61	237	74	199	81	68	79	139	82	35	57	62	60
	Natural Science	6	76	49	217	61	147	37	57	62	110	60	44	76	87	86
	Pre-Medicine	5	89	72	268	88	205	85	72	83	149	85	50	82	82	83
Education	Total	45	88	70	223	63	180	64	66	77	102	52	33	53	55	48
	Music	4	86	66	194	37	144	34	54	57	76	27	22	22	47	36
	Elementary Education	6	86	66	241	76	187	71	75	86	104	54	37	62	51	41
	History and Social Studies	6	80	55	159	14	144	34	44	38	83	34	27	34	53	44
	English	11	95	85	255	84	204	85	83	90	123	71	40	67	67	66
Business	Total	49	80	55	221	61	159	45	46	41	104	54	45	77	62	60
	Personnel	4	81	57	246	79	193	76	71	82	127	75	37	62	73	73
	Secretarial	5	85	64	209	52	172	58	37	25	82	33	41	68	53	44
	General Business	5	84	62	234	71	170	56	52	54	127	75	47	79	72	72
	Merchandising	10	73	46	205	48	143	33	45	39	115	64	40	67	51	41
	Accounting	16	75	48	220	61	154	42	41	33	99	49	49	81	67	66
Miscellaneous	Law students (3rd year)	16	86	66	232	69	174	60	61	69	137	81	45	77	72	72
	Dentistry seniors	8	72	45	178	25	119	16	39	29	90	41	43	74	80	81

* Percentile norms were calculated for each test for the total group of eight hundred twenty-seven Science, Literature and the Arts freshmen taking the tests in 1935. These percentiles indicate the per cent of this total group making scores lower than the average score for the curricular group.

Since the percentiles were found on the same population at the same time, the percentile values are directly comparable and can legitimately be plotted together on a profile. The relative performance of different groups on the same battery of tests can then be determined and presented in this graphic form since there is a common standard of reference.

The data in Table IV were used in constructing profiles for major groups graduating in 1939. They are grouped according to college and presented in Figs. 1, 2, and 3.

Figure 1 shows the percentile equivalents on each test for the mean scores obtained as freshmen by several of the groups who later gradu-

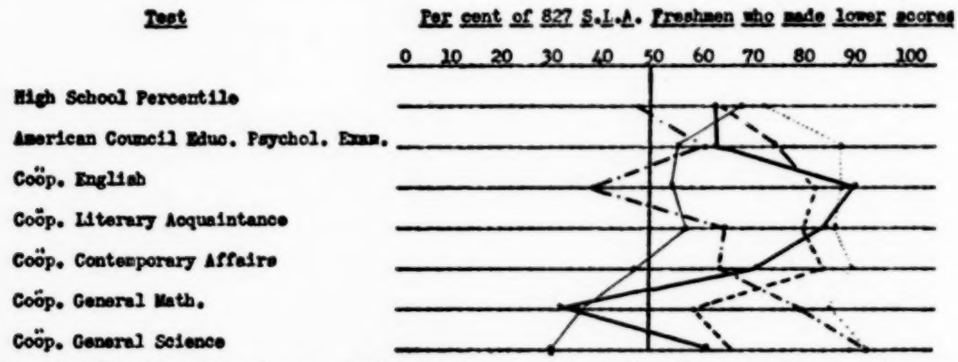

Test
Per cent of 827 S.I.A. Freshmen who made lower scores
0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 1.—Profiles of mean scores for major groups graduating from Science, Literature and the Arts in 1939, showing percentage of Freshman class making lower scores when tested in 1935.

——— = Library Science
——— = Sociology
— — — = Journalism
— · — = Natural Science
· · · · · · · · = Pre-Medicine

ated from one of the Science, Literature and the Arts major curricula. Figure 2 shows similar profiles for students who graduated from some of the major divisions of the College of Education. Figure 3 presents profiles for the Business School graduates in specified curricula.

Interesting contrasts in measured characteristics of freshmen who later became differentiated into curricular groups are evident from the graphic patterns. For example, differences between the profiles of premedics in Science, Literature and the Arts (Fig. 4) and dentistry students in the School of Dentistry (Fig. 5) are in the expected direction. The successful medical students were all exceptionally high in all measured characteristics as freshmen, whereas the students who managed to continue in the School of Dentistry were much lower except for achievement in mathematics and science where their scores

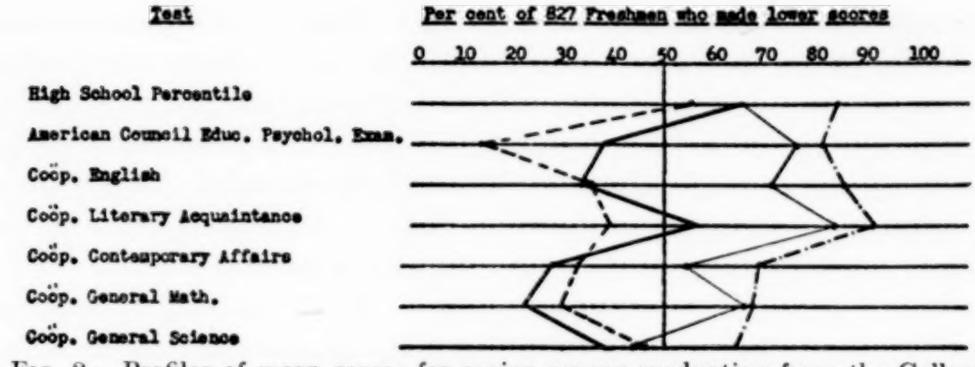

Test
Per cent of 827 Freshmen who made lower scores
0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 2.—Profiles of mean scores for major groups graduating from the College of Education in 1939, showing percentage of Freshman class making lower scores when tested in 1935.

——— = Music Education
——— = Elementary Education
— — — — = History and Social Studies Education
— · — · — = English Education

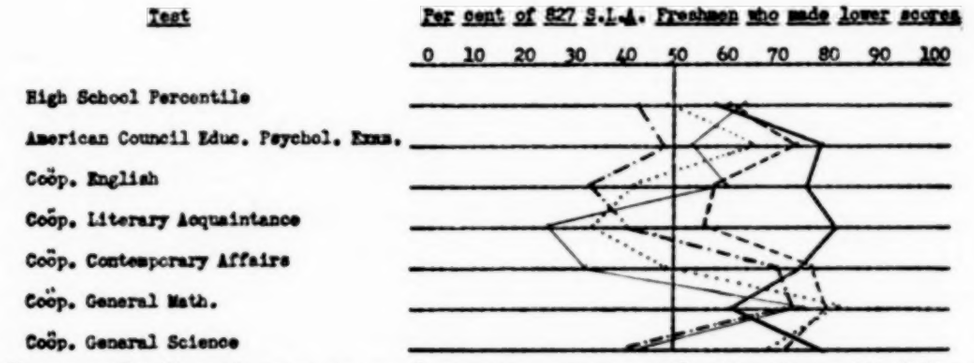

Test
Per cent of 827 S.L.A. Freshmen who made lower scores
0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 3.—Profiles of mean scores for major groups graduating from the School of Business Administration in 1939, showing percentage of Freshman class making lower scores when tested in 1935.

——— = Personnel
——— = Secretarial
— — — = General Business
— · — · = Merchandising
· · · · · · · · = Accounting

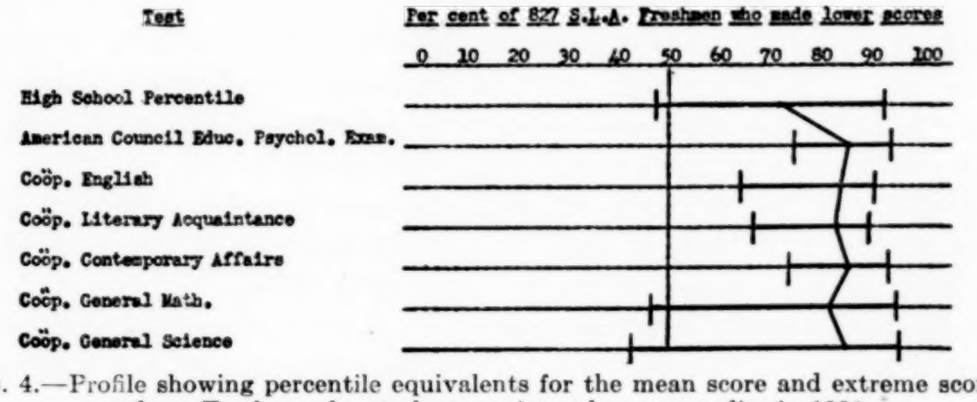

Test
Per cent of 827 S.L.A. Freshmen who made lower scores
0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 4.—Profile showing percentile equivalents for the mean score and extreme scores made as Freshmen by students registered as pre-medics in 1939.

equalled those of the premedical students. The natural science majors also equalled the premedics in mathematics and science background, but were lower as freshmen in all other measured abilities. On scholastic aptitude and achievement in English most of the dentistry groups were below the average for students entering the Science, Literature and the Arts College. In contrast to the dentistry students, the journalism majors were high in all areas except mathematics and science.

Other interesting points are apparent. All of the business students were relatively high in mathematics with profiles of similar shape except for the personnel majors who were relatively superior in all areas. The library science majors are very high in English mechanics and literature but mediocre in other areas of achievement. History and social studies majors and music majors in Education were, on the average, very low as freshmen in most of the tests, whereas English majors preparing to teach were exceptionally high.

High scores on the mathematics test are characteristic of business students who tend, on the whole, to be low on English mechanics and literature. High scores on the Contemporary Affairs test are more characteristic of students remaining in Science, Literature and the Arts than of those transferring to Business and Education.

It must be pointed out that these profiles represent average performance of groups. For each there is some variation of scores around the average. In order to show the extent of that range in scores we have presented three typical patterns, including the range as well as central tendency. The extreme high and low scores for each test were referred to the percentile norms and the percentage of the total Science, Literature and the Arts group below those scores has been plotted on the profile. The area drawn on the profile, therefore, shows the entire range of the curricular group in contrast to the range for the undifferentiated total freshman class. Figure 4 presents the pattern for premedical students. This group was relatively homogeneous at entrance to college. Figure 5, giving the mean and range of measured characteristics for dentistry students as freshmen, shows a homogeneity with respect to some abilities but a large scattering for others. The law students (Fig. 6) as freshmen, while superior on the average to the freshman class, include in their ranks students from almost the entire range of abilities measured by this particular battery.

As stated earlier, our main object in this paper is to demonstrate that this method is applicable for the determination of the measured characteristics of students who subsequently are successful in following

their chosen educational goal. The specific results presented here may have some practical value if used cautiously. We do not know as yet whether they would be substantiated for other years.

There seems to be a real relationship between the amount and type of abilities and information possessed by a student as a freshman and

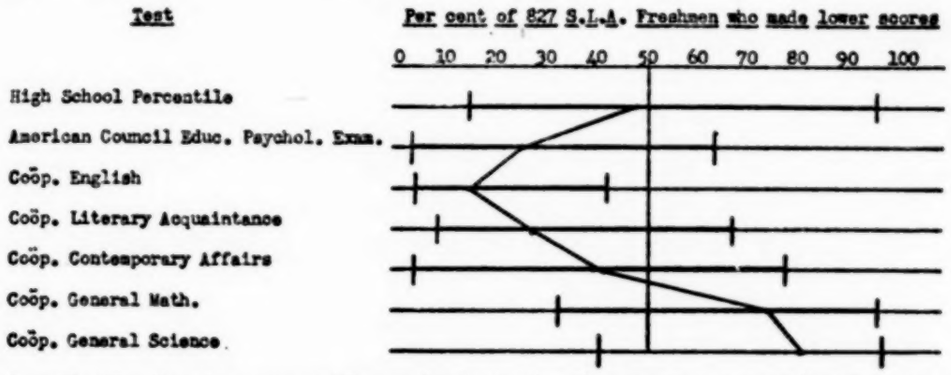
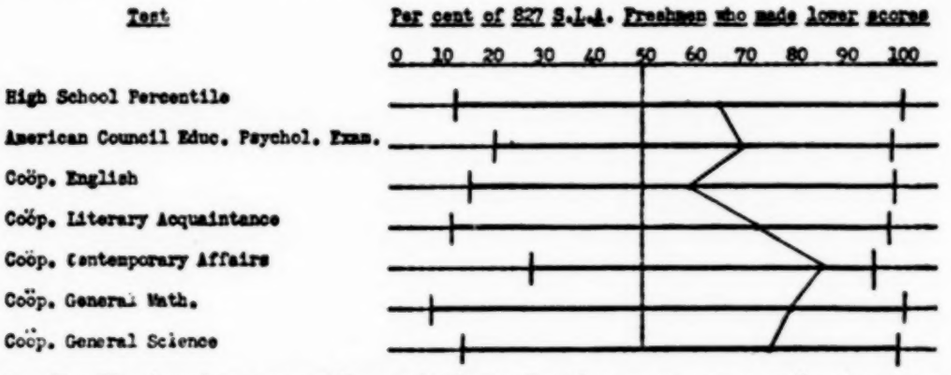

Test
Per cent of 827 S.L.A. Freshmen who made lower scores
0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 5.—Profile showing percentile equivalents for the mean score and extreme scores made as Freshmen by students registered in the School of Dentistry in 1939.

the curriculum from which he will graduate at the end of four years. By realizing what this relationship is, it may be possible to measure the prospective student before he begins his collegiate career, and by inspecting the pattern of his test scores, (along with all other pertinent


Test
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0 10 20 30 40 50 60 70 80 90 100
High School Percentile
American Council Educ. Psychol. Exam.
Coöp. English
Coöp. Literary Acquaintance
Coöp. Contemporary Affairs
Coöp. General Math.
Coöp. General Science

FIG. 6.—Profile showing percentile equivalents for the mean score and extreme scores made as Freshmen by students registered as third year law students in 1939.

and available information) and the pattern for various educational and professional goal groups, to guide him in choosing that curriculum in which his chances for success are maximal.*

* Since the completion of the present investigation, a similar article has appeared by Dewey B. Stuit and Mary C. Donnelly entitled "Performance in the Iowa Qualifying Examination of Majors in Various Academic Departments with Implications for Counseling," in the *Journal of Experimental Education*, Vol. VIII, 1940, pp. 293–299.

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FUNCTIONAL ARITHMETIC, 1893–1940; A REVIEW OF TYPICAL THEORETICAL DISCUSSION AND THE THEORY TO WHICH IT HAS LED

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The functional theory of arithmetic has its foundations in the general reaction against formalism which may be traced to the theories of such men as Rousseau and Herbart. The term is flexible in meaning, but teachers refer to it as the usable and practical arithmetic which functions in serving the individual and which satisfies a need inherent in a situation brought about by the practical activities of life.

During the decades of 1890–1910 we find literature appearing which indicates a beginning concern over the formalism of arithmetic and hinting of a possibility that the subject may be given a more practical application to social living. In 1893, Jackson[1] published some lines which have a decided modern tone. He writes that "Arithmetic more strongly than any other subject stands intrenched in the dogmas and tradition of the past . . . When one looks back over his school days, no other subject looms up in such proportions as arithmetic . . . The conclusion is that the time given to arithmetic must be reduced . . . It is within the bounds of truth perhaps to say that nine-tenths of all the so-called concrete problems found in our arithmetics deal with questions of values. This is a mistake, value is wholly relative, and it grows out of the fact that man is a social being. While adult man willingly subjects himself to the laws which the necessities of his social relations place upon him, the child does not recognize any such laws . . . Nor can the teacher materially hasten the time when the idea of value can be gained. The value of a dollar is known only when it has been earned. The time is certainly not preceptibly hastened by the early introduction of toy money and imaginary counters. These devices have about as much to do with the notion of developing value in the mind of the pupil as the skin of a stuffed monkey has with developing an idea of the South American fauna. Most of such devices are nothing but the stuffed monkeys of mathematics."

The reader will notice in this article two topics that are of recent interest. First, recognition of the principle of levels of maturity; and, second, no sugar-coated artificial devices of motivation.

[1] Jackson, W. S.: "The Relation of Arithmetic to Elementary Science." *Educational Review*, Vol. v, Jan. 1893, p. 35.

Jackson's reference to values appears unimportant when we examine the "Psychology of Number" by Dewey[1] (1896). The authors maintain that "Number represents valuation." Number is the tool whereby modern society in its vast and intricate processes of exchange introduces system, balance and economy into those relationships upon which our daily life depends. Properly conceived and presented, neither geography nor history is a more effective mode of bringing home to the pupil the realities of social environment in which he lives than is arithmetic. Society has its form also, and it is found in the processes of fixing standards of value and methods of valuation, the processes of weighing and counting, whether distance, size, or quality; of measuring and fixing bounds, whether in space or time, and of balancing the various resulting values against one another. Arithmetic cannot be properly taught without being an introduction to this form."

In 1898, McLellan and Ames[2] published two elementary texts based on Dewey's principles. These principles indicate that number is the tool of measurement, and that measurement takes its rise in human activity satisfying human needs. A description of the experimental school supervised by Dewey at the University of Chicago between the years 1896–1903 illustrates a more determined effort to put Dewey's philosophy into practice. Here a definite attempt to make arithmetic actually function in the lives of pupils was made. Mayhew and Edwards[3] report that "By the time the four-year-old child arrives at school he has his own experience, a background of content and acquaintance with social and physical realities. Out of this fertile soil will grow his first concepts of the use of the symbols of language, quantity, or value . . . A child becomes interested not only in the origin of the symbols for numbers, but in the measurement units of all kinds . . . As the children made simple machines, scales, a wheeled cart, a wheelbarrow, a patler's wheel, small and large looms, a pile-driver, a foot automobile, they formulated and made use of equations of ratios and proportion."

A brief article worthy of mention appearing in 1903 is that of

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[1] McLellan, James A., and Dewey, John: *The Psychology of Number.* New York: D. Appleton and Company, 1896, p. xiii.

[2] McLellan, James A. and Ames, A. F.: *The Public School Arithmetics.* Macmillan Company, New York, 1899.

[3] Mayhew, Katherine C. and Edwards, Anna C.: *The Dewey School.* D. Appleton-Century Company, New York, 1936, pp. 339–346.

Stanwood[1] which describes how the natural environment of Hawaii, with its seeds and flowers, is used to teach number.

In another early publication (1907) Young[2] devotes considerable space to the importance of arithmetic to social living. After distinguishing the difference between pure and applied mathematics he gives three reasons why arithmetic should be given a larger place in elementary schools. First, the mental discipline from applied mathematics is in many respects superior to the discipline from any other subject; second, the formation of habit is an essential factor in all education (among the habits we should cultivate is the mathematical habit); third, the modern arithmetic which gets its problems from practical affairs of our complex industrial organization, tends to widen the horizon of experience more than any other subject.

One of the first important books appearing in the decade 1910–1920 was "The Teaching of Primary Arithmetic" by Suzzalo.[3] The importance of object teaching is discussed both historically and psychologically, showing failures resulting from narrow views of the purpose of such an aid as contrasted to the success that may be expected from more rational use of number material. The book mentions no specific activities and describes no projects or units but suggests a trend of improving subject-matter problems by selecting them from real social situations.

In 1914 an important study was reported by Kirkpatrick[4] giving the results of an experiment in memorizing *versus* incidental learning. Results of this experiment indicate that in many lines of teaching there has been a tremendous waste of time, energy and interest in first memorizing, then later practicing, the use of what has been learned and that pupils do better when practice is guided by their own knowledge than when it is directed by authority of book or teacher.

In 1915, Meriam[5] and in 1923, Collings[6] reported experiments of a

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[1] Stanwood, C.: "Suggestion for Number Work." *Education*, Vol. XXII, January, 1903, pp. 308–309.

[2] Young, W. H.: "Educational and Practical Value." *Education*, Vol. XXVII, Feb., 1907, pp. 326–333.

[3] Suzzallo, Henry: *The Teaching of Primary Arithmetic.* Houghton Mifflin Co., Boston, 1911.

[4] Kirkpatrick, E. A.: "An Experiment in Memorizing *Versus* Incidental Learning." *Journal of Educational Psychology*, Vol. V, Sept., 1914, pp. 405–441.

[5] Meriam, J. L.: "How Well May Pupils Be Prepared for High-school Work without Studying Arithmetic, Grammar, etc., in the Elementary Schools?" *Journal of Educational Psychology*, Vol. VI, June, 1915, pp. 361–364.

[6] Collings, Ellsworth, and Kilpatrick, Wm. H.: *An Experiment With a Project Curriculum.* The Macmillan Co., New York, 1923.

similar nature in functional learning. These studies taken together suggest that a considerable change in the nature of arithmetic work in all grades would not result in any marked reduction in the efficiency of computation and at the same time would make it possible to enrich greatly the work in arithmetic by emphasizing the informational, sociological, and psychological functions of the subject.

A book widely quoted is that by Wilson and Wilson[1] appearing in 1916 (revised edition 1922). The authors point out the demand for practical arithmetic. This subject is motivated easily through competition; it has many practical applications to other school work, especially in manual training, domestic science, agriculture, history and geography, and physical education; it may also be motivated by imaginary problems. A description is given of special problems which have practical applications. In 1926 Wilson[2] summarizes and interprets his own investigations on adult arithmetic usage, and the investigations of students under his guidance, as well as the investigations of Wise, Woody, Thorndike, Mitchell, Charters, Bobbitt, Schorling, and others.

At this point it will be appropriate to mention the important contributions of two important educational organizations, the National Society for the Study of Education and the National Council of Teachers of Mathematics. Two yearbooks of the National Society for the Study of Education are outstanding in their contributions to arithmetic theory. The Twenty-Ninth Yearbook[3] attempts to bring out the theoretical aspects of arithmetic up to 1930. Statements in the introduction, written by Knight, present the point of view in this volume, *i.e.*, a child's present life is but a part of himself, and an educational philosophy based upon the assumption that the present interests, needs, strengths, weaknesses, whims of the child comprise the sole or dominating aspect of the child will in practice render but limited service. Furthermore, it is not enough to cast education in terms of children's present interests and desires alone. The future must be considered. The psychology upon which the book is based is a behavioristic one, viewing skills and habits as fabrics of connections.

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[1] Wilson, H. B. and Wilson, Guy M.: *The Motivation of School Work.* Boston, Houghton Mifflin Co., 1916 (revised 1922), pp. 158–185.

[2] Wilson, G. M.: *What Arithmetic Shall We Teach?* Houghton Mifflin Co., Boston, 1926.

[3] National Society for the Study of Education. *The Twenty-Ninth Yearbook.* Public School Publishing Company, Bloomington, Illinois, 1930.

The Society's Thirty-eighth Yearbook,[1] Part 1, undertakes to present such data as are available to indicate at what period in a child's life, from birth to adulthood, he can most advantageously undertake any given activity or achieve any given unit of learning. Two chapters are devoted to the subject of arithmetic. Brueckner[2] concludes that the arithmetic curriculum should place much greater emphasis on social arithmetic, that the core of the curriculum should consist of a series of carefully selected units of social arithmetic of demonstrated value adapted to the needs, interests, and level of progress of the pupils, that through these units the pupil should also be led to see the functional value of the various number processes and be given ample opportunity to apply them in a meaningful way, and that careful consideration must be given to the question of individual differences. Washburne[3] presents the techniques, methods, results, and criticisms of the work of the Committee of Seven on grade-placement in arithmetic. This committee has attempted to use an experimental technique that controlled both time and method which would determine the optimal mental age at which arithmetical processes can be learned to completion. Washburne thinks, however, that a more functional "activities" approach, based upon children's actual experiences and their feeling of need, might produce results decidedly different from those produced by a more formal type of systematic instruction. The tests given were of the formal arithmetic test type; that is they evaluated the child's knowledge by his ability to perform in the abstract the operation he was previously taught.

Beginning in 1926 the yearbooks of the National Council of Teachers of Mathematics began to appear. In the second yearbook Knight[4] criticizes the utility theory as advocated by Wilson and others. His argument is stated as follows: "Just what is useful is not always clear. For illustration a favorite diversion is to take a fling at the second case of percentage . . . it seems to the writer that the idea used

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[1] National Society for the Study of Education. *The Thirty-Eighth Yearbook*. Public School Publishing Company, Bloomington, Ill., 1930.

[2] Brueckner, L. J.: "The Development of Ability in Arithmetic." *Ibid.*, pp. 275–298.

[3] Washburne, Carleton: "The Work of the Committee of Seven on Grade-Placement." *Thirty-Eighth Yearbook*. National Society for the Study of Education. Pub. School Pub. Co., Bloomington, Ill., pp. 299–324.

[4] Knight, F. B.: "Some aspects of Elementary Arithmetic." National Council of Teachers of Mathematics. *Second Yearbook*. New York, Bureau of Publications, Teachers' College, Columbia University, 1927, p. 21.

in the second case of percentage would be extremely useful if anyone knew how to use that idea. With the advance of skill in teaching arithmetic, many skills which now seem socially hopeless may prove of enough use to pay for themselves because pupils can use them; now they cannot through lack of mastery of them.[1]

Judd writes in the third yearbook on the "Fallacy of Treating School Subjects as Tool Subjects."[2] His main argument is against the "utility method" of curricula construction. Arithmetic should be more than a tool. It functions in the experiences of modern life. As an example he takes the necessity of "precision." Precision is sought in standardization in the discharge of one's trust, in the statements which men make to their fellows. Precision is the soul of science and of commerce.

Wilson again in 1931[3] defends the utility theory as opposed to the mental discipline theory. Number, he says, as social psychology or philosophy of life has no place in the elementary grades. It is formalism—meaningless, unmotivated procedure which constitutes the fundamental difficulty. The typical type of written problem found in arithmetic textbooks should be omitted and replaced with life situations based upon the business of the community.

The titles of the remaining yearbooks of the Association (fourth to fourteenth inclusive) indicate the general trend of thought in the subject of arithmetic up to 1939. These titles are as follows: Significant changes and trends in the teaching of mathematics throughout the world since 1910, the teaching of geometry, mathematics in modern life, the teaching of algebra, the teaching of mathematics in the secondary school, relational and functional thinking in mathematics, the teaching of arithmetic, the place of mathematics in modern education, approximate computation, the nature of proof, and the training of mathematics teachers.

The progress and status of arithmetical theory up to 1935 is no doubt best expressed in the Tenth Yearbook.[4] In this volume

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[1] *Ibid.*, pp. 21–22.

[2] Judd, C. H.: "The Fallacy of Treating School Subjects as Tool Subjects." National Council of Teachers of Mathematics. *Third Yearbook*. New York, Bureau of Publications, Teachers College, Columbia University, 1928.

[3] Wilson, Guy M.: "The Present Impasse in Arithmetic." *Journal of Educational Methods*, Nov. 1931, pp. 65–72.

[4] *Tenth Yearbook* of the National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia University, 1935.

Brownell[1] sets forth in clear and brief statement the current and past theories upon which arithmetic is based. These he classifies as (1) the drill theory which, he says, is based upon two misleading approaches: (*a*) Analysis of adults uses of arithmetic and (*b*) the "bond" theory of learning; (2) the incidental theory of learning; and, (3) the meaning theory. The assumption underlying the drill theory is that there are certain fundamental foundations of knowledge and skills which must be selected in advance to be learned. These skills may be developed by going through the requisite processes until automatic and accurate response is made. The incidental theory assumes that children will learn as much arithmetic as they need if they are not systematically taught arithmetic and that adequate number concepts will develop and the necessary fundamental processes will be acquired through natural behavior in activities which are only partially arithmetical. The intensity of immediate interest will, they believe, be sufficient to fix the process; or, if it is not fixed, further uses of it in constantly recurring life situations will be sufficient for eventual mastery. The meaning theory contains features of the two preceding theories with special stress on the point that children should see sense in what they learn. The true test of arithmetical knowledge is an intelligent grasp of number relations and the ability to deal with arithmetical situations with proper comprehension of their mathematical as well as their practical significance. Drill is advocated, and ideas and processes are to be practiced in order to fix them for retention or in order to increase proficiency.

In this same volume Buckingham[2] contrasts informational arithmetic with computational arithmetic. Informational arithmetic refers to understanting, interpretation, and use rather than to processes and skills. "Can we not give our own interpretation to arithmetic and make it the means by which, even from the first school days, the child acquires information about number and an ability to think in quantitative terms?" Buswell[3] says that arithmetic should be judged primarily in terms of its social values. He thinks the recent movement

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[1] Brownell, W. A.: "Psychological Considerations in the Learning and the Teaching of Arithmetic." *Ibid.*, pp. 1–30.

[2] Buckingham, B. R.: "Informational Arithmetic." *Tenth Yearbook.* National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia University, 1935, pp. 1–30.

[3] Buswell, G. T.: "The Relation of Social Arithmetic to Computational Arithmetic." *Ibid.*, pp. 74–84.

to balance the teaching of arithmetic by giving increasing emphasis to its social and informational values is a movement so significant that it may well become the outstanding reform which this generation will contribute to the subject. Closely in agreement with this point of view is that of Smith,[1] who points out that one of the most encouraging contributions of the present is what is often called "the arithmetic of environment," *i.e.*, arithmetic is unconsciously blending with economics and with a study of national resources.

After presenting data on incidental opportunities of teaching arithmetic, Hanna[2] and others conclude that the present activity program does not assure a comprehensive orientation in arithmetic. Overman[3] summarizes experiments on transfer. He concludes that transfer does often result; that the amount of transfer depends not only upon the relation between the taught and the untaught functions, but upon the method of teaching, and is greatly increased, at least in some cases, by methods of teaching. The problem of transfer is discussed further by Wheeler and, in the Fourteenth Yearbook, by Fawcett.

The influence of Gestalt psychological theory as applied to arithmetic is probably best reflected in the interpretations of Wheeler. In 1932 Wheeler and Perkins were among the first to give emphasis to this point of view when they devoted several pages in their book *Principles of Mental Development*[4] to the subject of arithmetic. Their point of view was further emphasized and clarified by Wheeler in the Tenth Yearbook,[5] where he contends that the psychology of learning upon which arithmetic is based rests on false assumptions, *e.g.*, that sense impressions are the beginning of mental life, that progress in any subject follows laws of repetition, exercise, and effect, that mental processes are composed of skills. The main principles of the

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[1] Smith, D. E.: "Retrospect, Introspect, Prospect." *Tenth Yearbook.* National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia Univ., 1935, pp. 201–211.

[2] Hanna, P. R.: "Opportunities for the Use of Arithmetic In an Activity Program." *Ibid.*, pp. 85–120.

[3] Overman, J. R.: "The Problem of Transfer in Arithmetic." *Tenth Yearbook.* National Council of Teachers of Mathematics. New York: Bureau of Publications, Teachers College, Columbia Univ., 1935, pp. 173–185.

[4] Wheeler, R. H. and Perkins, F. T.: *Principles of Mental Development.* Thomas Y. Crowell Co., New York, 1932, pp. 479–492.

[5] Wheeler, R. H.: "The New Psychology of Learning." *Tenth Yearbook.* National Council of Teachers of Mathematics, Bureau of Publications, Teachers' College, Columbia University, New York, 1935, pp. 233–250.

New Psychology are that learning is a function of maturation and insight, that first impressions are of total situations, but are undifferentiated, that learning is not exclusively an inductive process, that learning does not proceed by trial and error, that the personality of the teacher is more important than prescribed methods, and that learning depends upon the will to learn. Learning can only occur when goals are clear. Learning is a matter of incident depending on transposition, discovery of form, system, order, pattern, logical relations, analogies and making rational judgments; learning does not occur when subjects are isolated; and learning does not transfer unless the material is connected with the field to which transfer is desired.

This leads us to a consideration of the investigations of Fawcett.[1] This investigator describes classroom procedures by which geometric proof may be used as a means for cultivating critical and reflective thought and gives an evaluation of the effect of such experiences on the thinking of pupils. Fawcett summarizes his discussion on the nature of proof by stating that proof has universal interest in most activities of life whether these activities be social, economic, religious, or academic. It is of interest to pupils to the extent that they consider proof almost sacred. To let students believe that they begin the study of proof by memorizing a number of "self-evident truths" is to take the first of a series of steps which will tend to deaden their critical faculties and give them a distorted and misleading idea concerning the relationship between "proof" and "truth." The axioms and postulates of Euclid have become regarded as almost divine and to remain unchanged by eternity. These axioms and postulates which Euclid held to be self-evident are, however, outright assumptions, and mathematics teachers know or should know that a number of them have been challenged and changed by the courage of thinking men who were not under the spell of a "Mount Sinai experience." Fawcett states that in a science class, "an hypothesis" is no longer a statement of the given data, but rather a tentative generalization suggested by these data which further and more careful investigation may either prove or disprove. Is there any good reason why this term cannot

[1] Fawcett, H. P.: "The Nature of Proof." *Thirteenth Yearbook*. The National Council of Teachers of Mathematics, Bureau of Publications, Teachers' College, Columbia University, New York, 1938; also "Statement of a Hypothesis Concerning Proof." *California Journal of Secondary Education*, Vol. XVI, March, 1941, pp. 180–185.

be used in the mathematics classroom in the same sense as it is used in the science classroom? Such a method would better develop the child in an understanding of what is meant by the relativity of truth. He would recognize the relation between a conclusion and the assumptions and definitions from which it was derived. He would learn how to detect the implicit or unstated assumptions behind any conclusion. He would learn what it means to challenge an assumption, for in the exercise of his free intellectual soverignty he can change an assumption to suit his own ideas and trade the inevitable effect of such a change on the conclusions which depend on that assumption. A proper emphasis from this point of view will offer opportunity for directing his attention to the many ways in which proof, with its associated ideas, is used in editorials, in magazine articles, in daily conversation, in political speeches, in advertisements, and in propaganda of all kinds.

The concept of proof is not a matter of mechanical memorizing of rules. It must come from encouraging pupils to formulate their own assumptions about the nature of the space in which they live—from encouraging pupils to reject those assumptions with which they do not agree, and from encouraging pupils to examine critically those which they are willing to accept.

Transfer is secured only by training for transfer and teachers of mathematics can no longer expect that the careful study of ninety or more geometric theorems will alone enable their students to distinguish between a sound argument and a tissue of nonsense.

In addition to the yearbooks of the National Council of Teachers of Mathematics Teachers which have been discussed, we should include a brief remark or two regarding the Eleventh Yearbook of this Council concerning the place of mathematics in modern education.[1] The point of view in this book may be illustrated by the remarks of Reeve[2] and Betz.[3] Reeve thinks the attacks on mathematics can be met by eliminating the stupid way in which many teachers continue to present both algebra and geometry, by showing that the subject of arithmetic

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[1] *Eleventh Yearbook.* The National Council of Teachers of Mathematics. The Place of Mathematics in Modern Education, Bureau of Publications, Teachers' College, Columbia University, New York, 1935.

[2] Reeve, W. D.: "Attacks on Mathematics and How to Meet Them." *Ibid.*, pp. 1–20.

[3] Betz, William: "The Reorganization of Secondary Education." *Eleventh Yearbook.* National Council of Teachers of Mathematics, Bureau of Publications, Teachers' College, Columbia University, New York, 1935.

is itself not at fault but rather the philosophy of its teaching, by more acceptance of training mathematics teachers by schools of mathematics rather than leaving the responsibility to teacher colleges. Betz discusses the salient characteristics of educational theories and practices. Among other things he states that the drill theory of teaching is one of the most obvious causes of wholesale educational failure.

Before attempting a summary of present arithmetical theory it should be mentioned that in 1937 three important articles appeared which were written by Spencer, Washburn, and Sister W. Marguerite which have a direct relation to functional arithmetic. The article by Spencer[1] points out that arithmetic is a basic social study because arithmetical concepts are among those which are most fundamental to society. Washburne[2] advocates the inclusion of only that arithmetic, in our curriculum which will function in the lives of pupils. Sister W. Marguerite[3] gives a useful review of the reaction against formalism in arithmetic 1890–1919.

It should be pointed out that teachers of children are beginning to realize the importance of arithmetic readiness. This interest is reflected in the articles by Brownell and Dickey. Brownell[4] concludes that instead of postponing topics, new ways are being sought to teach the content in grades I and II. This practice is justified by studies showing that pupils in these grades can learn arithmetic if it is properly presented. Dickey[5] presents evidence of maturation from psychological research.

SUMMARY

The mental discipline theory of arithmetic has been so modified that it is scarcely recognizable in its modern attire. Discipline will not result in the mechanical memorizing of rules. Teachers can no longer expect that the careful study of ninety or more geometric

[1] Spencer, P. L.: "Arithmetic: A Basic Social Study." *California Journal of Elementary Education*, Vol. v. Feb. 1937, pp. 144–152.

[2] Washburne, Carleton: "Functional Arithmetic." *Educational Method*, Vol. xvi, Jan., 1937, pp. 167–171.

[3] Marguerite, Sister W.: "Reaction Against Formalism in Arithmetic 1890–1919." *Catholic Educational Review*, Vol. xxxv, April, 1937, pp. 225–236.

[4] Brownell, W. A.: "Readiness and the Arithmetic Curriculum." *Elementary School Journal*, Vol. xxxviii, Jan., 1938, pp. 334–354.

[5] Dickey, J. W.: "Readiness for Arithmetic." *Elementary School Journal*, Vol. xl, April, 1940, pp. 592–598.

theorems will enable their students to distinguish between a sound argument and an instrument of propaganda. Transfer is a matter of relativity and will occur only when the desired element to be transferred is connected with the field to which transfer is desired.

The drill theory is losing ground. It is based on the incorrect assumption that sense impressions are the beginning of mental life, that learning occurs by repetition, and that mental processes are composed of skills. The theory is being replaced by a more modern theory based upon organismic or Gestalt psychology which assumes that first impressions are of total situations and undifferentiated, that learning is a matter of discovery of form, system, order, pattern, relations, and rational judgments, and that learning is a closely knit system of understandable ideas, principles, and processes. The true test of arithmetic learning is an intelligent grasp upon number relations and the ability to deal with arithmetical situations with proper comprehension of their mathematical as well as their practical significance.

An attempt is being made to give arithmetic increasing social and informational values, *i.e.*, to teach the "arithmetic of environment" by blending it with economics, social entities, and with national resources. This means increased attention to the value of children's experiences as a means of enriching number ideas, of motivating the learning of new arithmetical abilities, and of extending the applications of number to current life.

Closely related to the above theories is the increased recognition to the importance of maturity and readiness to arithmetic learning. This directs immediate attention to the functional uses of number in the affairs of children and to the proper sequence of the steps of difficulty related to arithmetic skills.

The future development of arithmetical theory will probably lie in the direction of (1) a continued and greater emphasis on the social significance of arithmetic as related to the life of the child, (2) a better placement of arithmetical topics and skills to fit the maturity of the child, (3) further investigations concerning the place and use of number in the life of the child as contrasted to the life of the adult, and (4) a continued modification of the psychological basis of arithmetic in line with the organismic and Gestalt viewpoint.

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THE RELIABILITY OF MONOCULAR PHOTOGRAPHY IN THE INVESTIGATION OF READING

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Oklahoma Agricultural and Mechanical College

Considerable interest has been manifested in the practice of plotting the fixation points of the eyes to determine the location of such fixations during the act of reading. Almost every one of the recent volumes on remedial reading has devoted a chapter or a part of a chapter to the discussion of this method of analyzing reading habits. Generally speaking, they have used as their illustrative material the copy of one of the plates presented in *Fundamental Reading Habits* by G. T. Buswell. The technique which is presented there for the plotting of fixation points has been accepted, and the conclusions drawn by that author have been adopted without question.

This report deals with the practice of plotting eye movements on reading material. Buswell in *Fundamental Reading Habits*[1] has plotted the fixation points of efficient and inefficient readers on easy prose material. The reason for such plotting is best given in his words (p. 7): "Mature reading demands a delicately coördinated type of eye movements. . . . Reading requires a delicate and continuous control of small eye movements." Further he states (p. 8), "The fact that they are not subject to direct conscious control makes them reliable as a measure of reading ability. The further fact that they are entirely objective in character, capable of yielding an accurate photographic record, makes the use of eye movements one of the most significant methods for the analysis of growth in reading."

Figure 1 is a copy of Plate X on page 78 of *Fundamental Reading Habits*. The serial numbers above the verticals indicate the order of the pauses. "An oblique line indicates a pronounced head movement, the exact location of the fixation being at some point between the ends of the oblique" (p. 2). This is the plotted record of the fixations for one eye. Whether it is the right eye or the left eye is not indicated. The oblique lines are undoubtedly plotted from a record on the film which is not exactly vertical but moved either to the right or left during the duration of the fixation. In each of lines two and six, there are two fixations which are plotted in the margin. Subsequent figures will illustrate more completely the significance of such marginal records.

PLATE X

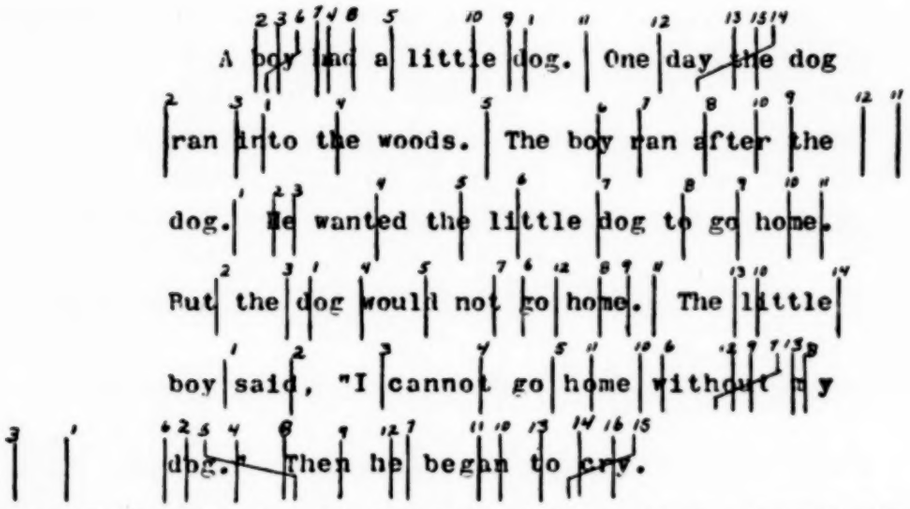
A boy had a little dog. One day the dog
ran into the woods. The boy ran after the
dog. He wanted the little dog to go home.
But the dog would not go home. The little
boy said, "I cannot go home without my
dog." Then he began to cry.

FIG. 1.—Silent reading by subject 11, Grade 1A, second test. (*From Fundamental Reading Habits, by G. T. Buswell. Reproduced by permission of the University of Chicago Press.*)

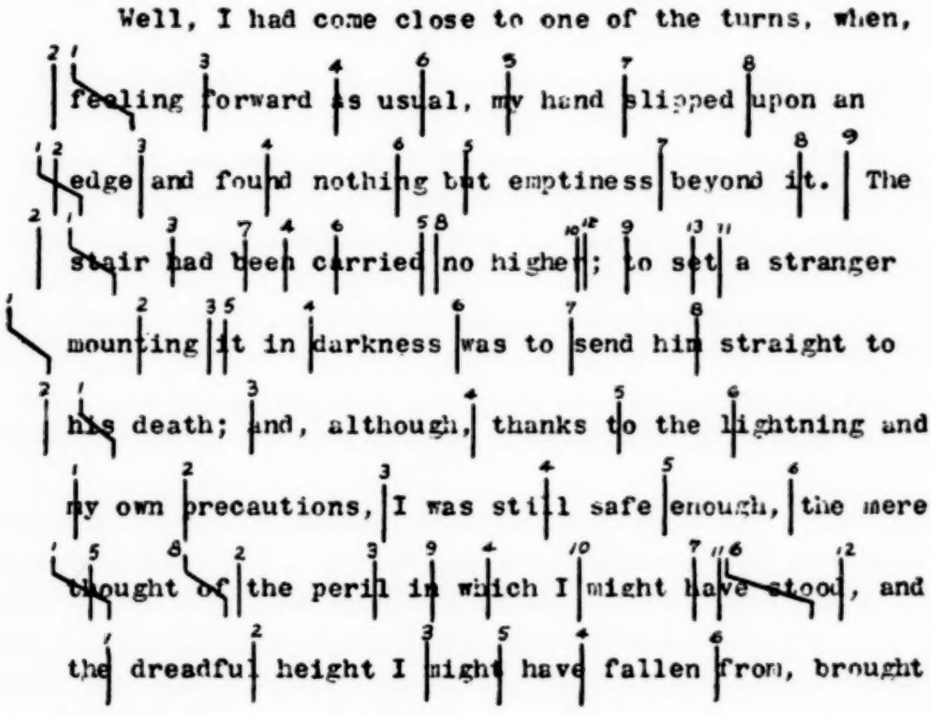
Well, I had come close to one of the turns, when,
feeling forward as usual, my hand slipped upon an
edge and found nothing but emptiness beyond it. The
stair had been carried no higher; to set a stranger
mounting it in darkness was to send him straight to
his death; and, although, thanks to the lightning and
my own precautions, I was still safe enough, the mere
thought of the peril in which I might have stood, and
the dreadful height I might have fallen from, brought
out the sweat upon my body and relaxed my joints.

FIG. 2.—Reading record of subject 24. Reading centile score 88. Record of right eye (*R*).

Figure 2 is the reading record for the right eye of a college sophomore. This individual has a centile rank of 88 on the Chapman-Cook Speed of Reading Test and is considered a fast reader. The letter *R* in the caption of the figure denotes that the subject is dominantly right-eyed. This record and that shown in Fig. 3 are for the same subject at the same time. Figure 3, however, illustrates the fixation pauses of the left eye. Both of these records are comparable to that shown in Fig. 1 which is the record of a first-grade pupil.

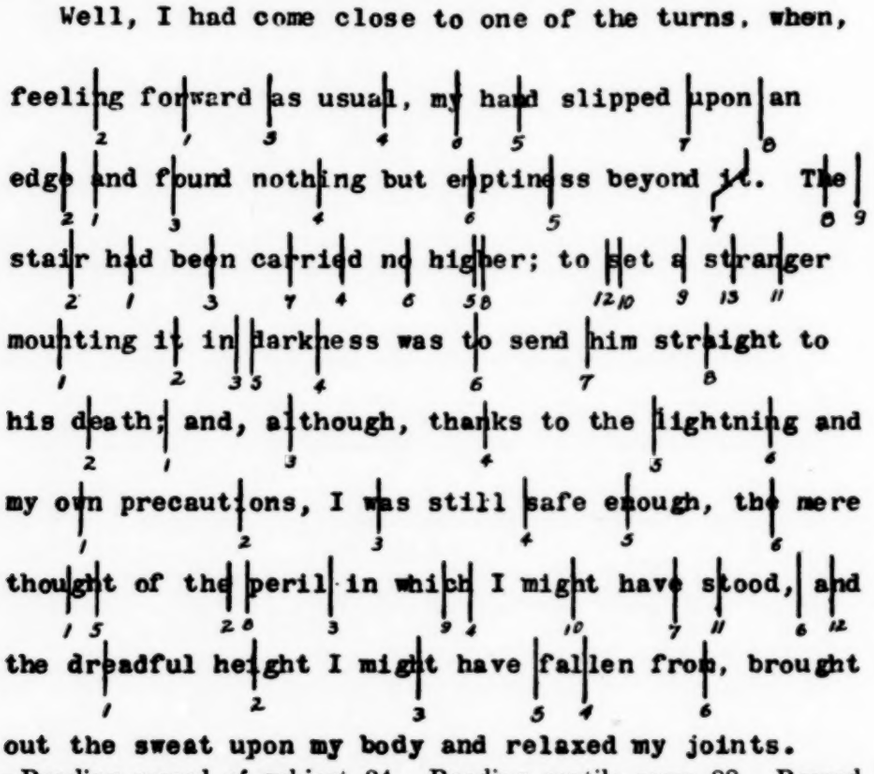
Well, I had come close to one of the turns, when,
feeling forward as usual, my hand slipped upon an
edge and found nothing but emptiness beyond it. The
stair had been carried no higher; to set a stranger
mounting it in darkness was to send him straight to
his death; and, although, thanks to the lightning and
my own precautions, I was still safe enough, the mere
thought of the peril in which I might have stood, and
the dreadful height I might have fallen from, brought
out the sweat upon my body and relaxed my joints.

FIG. 3.—Reading record of subject 24. Reading centile score 88. Record of left eye (*R*).

In Fig. 4 the right- and left-eye records of subject number 24 are combined into a single binocular record. The solid lines are the record of the right eye and the dotted lines are the record of the left eye. The right-eye fixations are serially numbered above the printed line and the left-eye fixations are numbered below the line of print. Many of the questions which arise from an examination of this record will be answered as subsequent figures are studied. It is sufficient here to point out the differences which occur between the plotted fixation points of the two eyes in every line of the reading selection. The fixation points for the two eyes vary as much as nine-letter spaces at the same moment in time in this record for the fast reader.

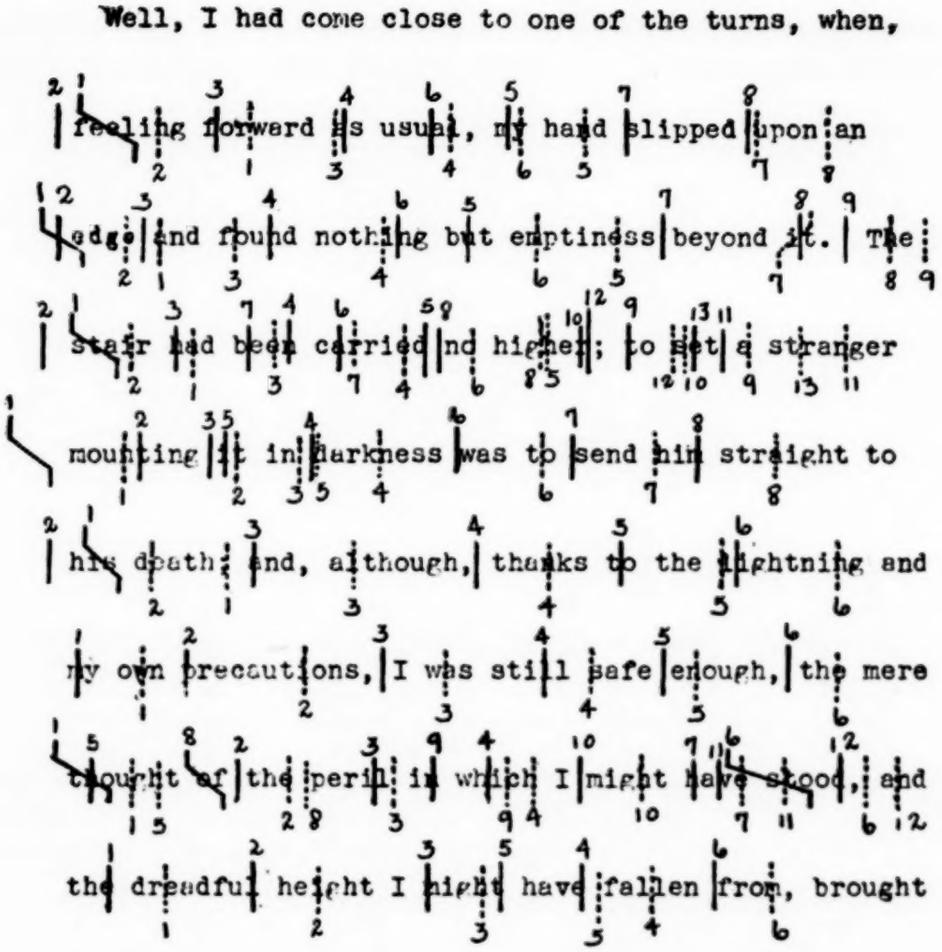
Well, I had come close to one of the turns, when,
feeling forward as usual, my hand slipped upon an
edge and found nothing but emptiness beyond it. The
stair had been carried round higher; to set a stranger
mounting it in darkness was to send him straight to
his death; and, although, thanks to the lightning and
my own precautions, I was still safe enough, the mere
thought of the peril in which I might have stood, and
the dreadful height I might have fallen from, brought
out the sweat upon my body and relaxed my joints.

FIG. 4.—Reading record of subject 24. Reading centile score 88. Binocular record (*R*).

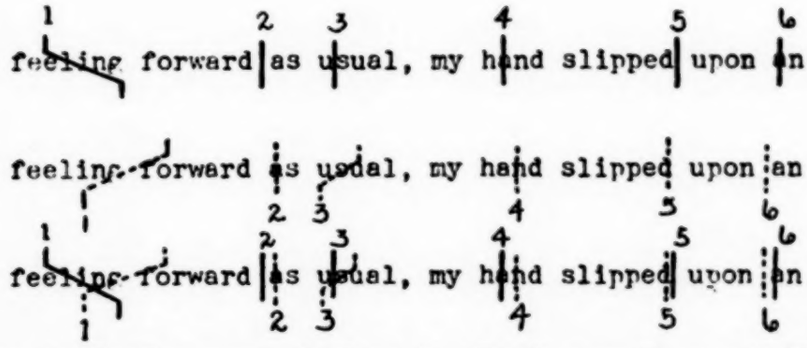
feeling forward as usual, my hand slipped upon an
feeling forward as usual, my hand slipped upon an
feeling forward as usual, my hand slipped upon an

FIG. 5.—Reading record of subject 27. Reading centile score 91 (*R*).

As quoted previously, Buswell has stated that "An oblique line indicates a pronounced head movement, the exact location of the fixa-

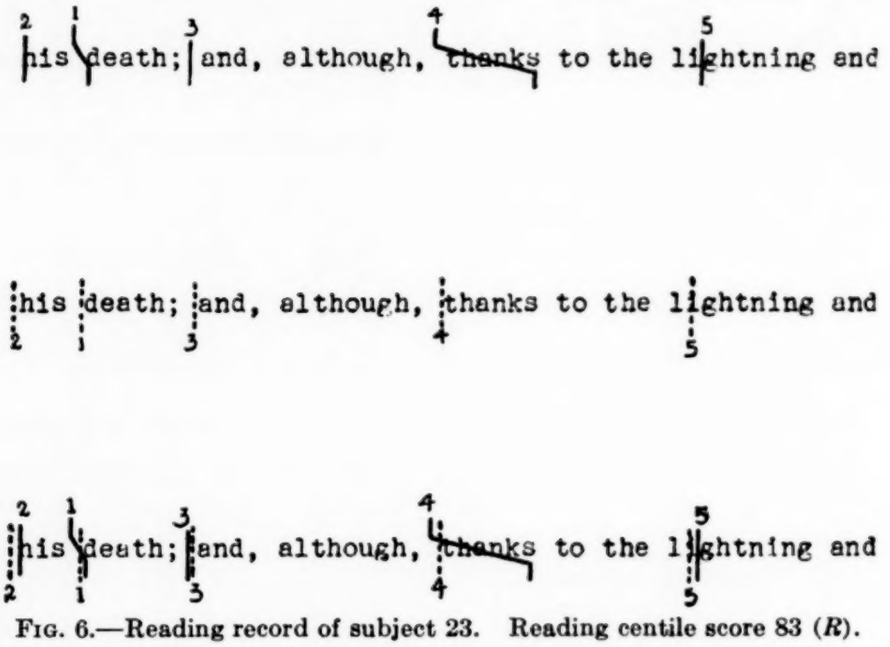
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and

FIG. 6.—Reading record of subject 23. Reading centile score 83 (*R*).

tion being at some point between the ends of the oblique." Figure 5 is the record of one line read by a very rapid reader. The solid lines

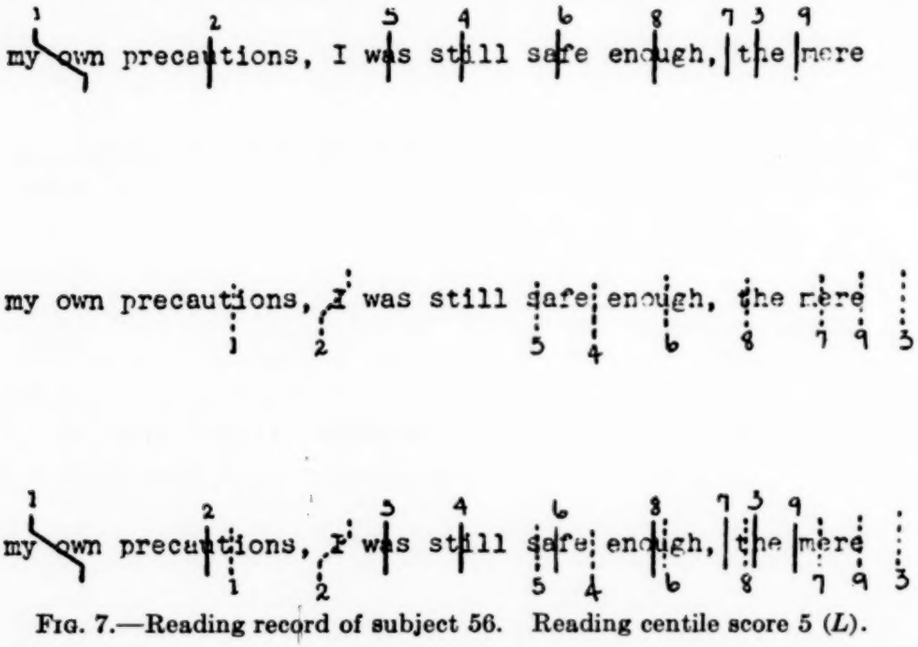
my own precautions, I was still safe enough, the mere
my own precautions, I was still safe enough, the mere
my own precautions, I was still safe enough, the mere

FIG. 7.—Reading record of subject 56. Reading centile score 5 (*L*).

represent right-eye fixations and the dotted lines represent left-eye fixations. If one were to plot either eye separately, one could postulate a head movement to account for the oblique fixation lines. It

would be impossible, however, for the college student whose head was tightly clamped in the head piece of the eye-movement camera to move

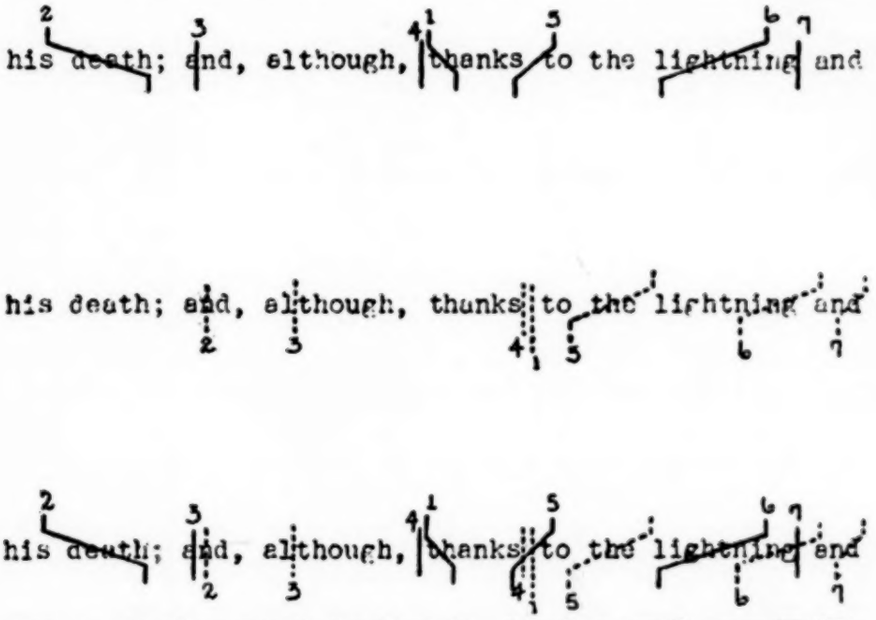
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and

FIG. 8.—Reading record of subject 40. Reading centile score 77 (*R*).

his head in two directions simultaneously as the third line shows. This simultaneous movement in opposite directions may be accounted

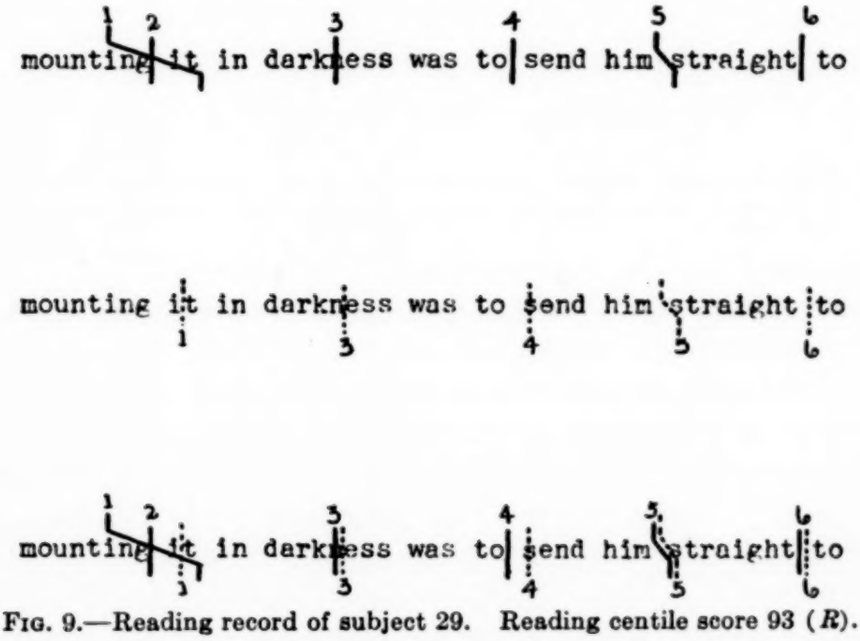
mounting it in darkness was to send him straight to
mounting it in darkness was to send him straight to
mounting it in darkness was to send him straight to

FIG. 9.—Reading record of subject 29. Reading centile score 93 (*R*).

for, as indicated by Stromberg,[3] by the divergence of the eyes at the beginning of the reading line. This divergence is necessary to over-

come the convergence which occurs during saccadic movements and is especially noticeable after the long return sweep to the beginning of a new line.

Figure 7 presents another fact which could be obtained only through the plotting of binocular records. At the time fixation num-

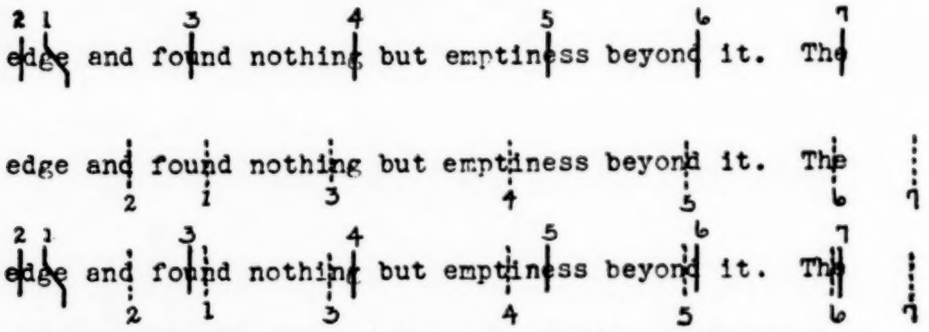
edge and found nothing but emptiness beyond it. The
edge and found nothing but emptiness beyond it. The
edge and found nothing but emptiness beyond it. The

FIG. 10.—Reading record of subject 56. Reading centile score 5 (*L*).

ber two was made, the right eye had not progressed along the line of print to the place where the left eye made its first fixation. During the first fixation, they were twelve-letter spaces apart. In spite of this fact, the ninth fixation of each eye is on the same four-letter word at the end of the line. This indicates that the right eye was making longer saccadic movements than the left eye, and yet Buswell states,

PLATE XVIII

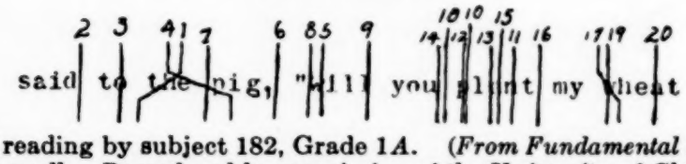

FIG. 11.—Oral reading by subject 182, Grade 1*A*. (*From Fundamental Reading Habits, by G. T. Buswell. Reproduced by permission of the University of Chicago Press.*)

(see above), " . . . mature reading demands a delicately coördinated type of eye movements." Some question may arise as to the adequacy of the plotted record of subject number fifty-six, (Fig. 7), since he has a centile score of only five on the reading test. That this record is an adequate illustration of the fact that the plotting of monocular fixations is inaccurate is indicated by an examination of the record of subject number forty, who is a fast reader, shown in Fig. 8.

Figure 9 illustrates the inaccuracy which results when the record of only one eye is plotted. With the right eye, subject number twenty-nine makes six fixations. These are plotted in line one of the figure. There are, however, only five fixations on the record of the left eye. Since fixations 3, 4, 5, and 6 coincide, it is evident that fixation one

of the left eye is equal to fixations one and two of the right eye. The duration of the first fixation of the left eye is equal to that of the first

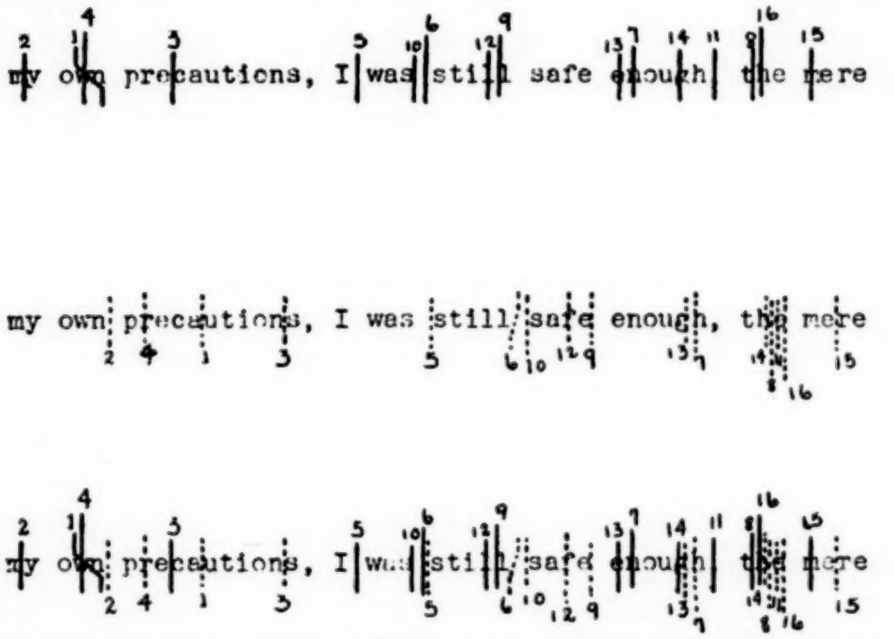
my own precautions, I was still safe enough the mere
my own precautions, I was still safe enough, the mere
my own precautions, I was still safe enough, the mere

FIG. 12.—Reading record of subject 48. Reading centile score 14 (*R*).

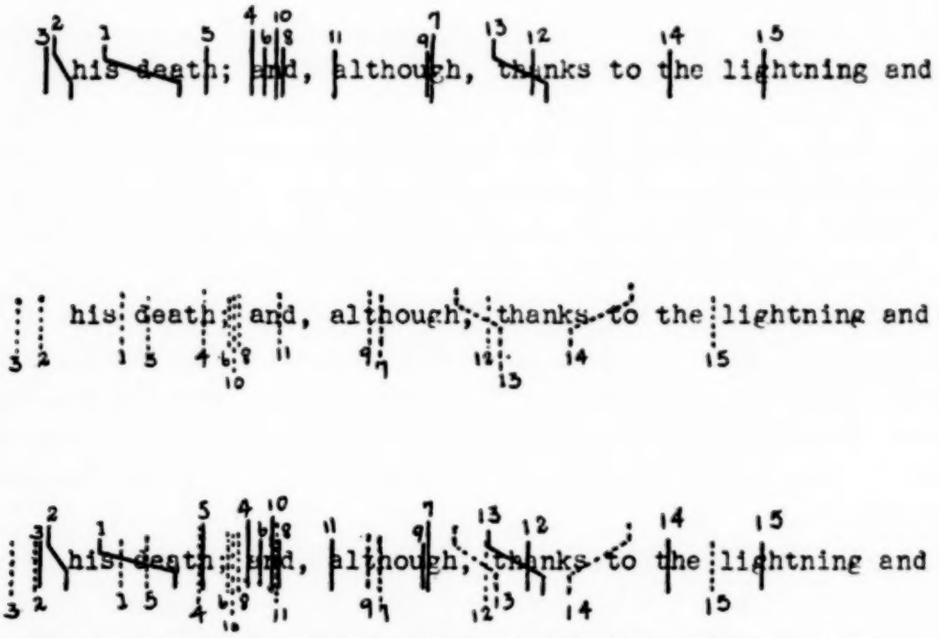
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and
his death; and, although, thanks to the lightning and

FIG. 13.—Reading record of subject 46. Reading centile score 9 (*L*).

two fixations for the right eye. This type of variation between the fixations of the right and left eye is not a common occurrence, but it is noted with a frequency great enough to indicate its importance. Fast

and slow readers alike demonstrate this inaccuracy of monocular records.

The first line of Fig. 10 shows a very regular and even record for the right eye. Line two of the figure shows fixation points of the left eye. When the two records are superimposed, as shown in line three, it is noted that although the fixations correspond in position, they are not the same fixations for each eye. Fixation number seven for the left eye is plotted in the margin beyond the line of print. If both eyes had been considered in plotting Fig. 1, the marginal fixations would perhaps correspond to direct fixation of the uncharted eye.

Figure 11 is a reproduction of a figure on page 87 of *Fundamental Reading Habits.* The following quotation is taken from pages 87 and 88 of the same publication. "In this record (Plate 18) the most noticeable characteristic is the accumulation of eye fixations upon the word 'plant.' The dictaphone record shows a hesitation on the words 'will you' . . . which gave time for a careful examination of 'plant' before its pronunciation was attempted. . . . The word was mastered but not without a careful analysis."

The next figure, 12, shows the accumulation of fixations in the record of a college sophomore. Although he is not a rapid reader, one would hesitate to say that the accumulation of four fixations with the left eye and two with the right eye is an indication that the three letter word t-h-e is giving him difficulty. The record shown in Fig. 13 raises a similar question, for the word a-n-d is not usually difficult for college sophomores. In *Fundamental Reading Habits,* as well as in *How Adults Read,*[2] Buswell speaks of such accumulations of fixations as indicative of the lack of word comprehension or as stated in the latter reference, (p. 3), "At no place in the selection was there a cluster of fixations which would indicate a point of mental confusion." Even though the records shown in Figs. 12 and 13 are those of slow readers, there can be no conclusion drawn regarding "mental confusion." Similar clusters of eye fixations are found in the records of fast readers.

On page 49 of *How Adults Read* Buswell has illustrated the plotting of fixation points during reading by subject 983. This is also a monocular chart with no indication of whether the record of the right eye or the left eye has been plotted. Of this plot Buswell says, (p. 52), "Plate XIII shows the plotting of the positions of fixation on the lines of print for this subject. By comparing the film with this plotting, the reader may see *exactly where the eyes paused* (italics mine) on each

of the lines." This statement assumes that the records of the two eyes are identical. In the plotting of the binocular fixation points of over one hundred twenty-five college students in this experiment, variations in the fixation points of the two eyes are found in one hundred per cent of the cases.

If the binocular records of college students in reading easy prose show such tremendous variations, it follows that binocular records for reading numbers, formulae, and scientific material would show equal, indeed greater, variations than those found for simple prose. Further, what would the result be if binocular fixations in looking at advertising material or pictures were plotted? Eye movements made under the latter conditions are not simple saccadic movements, but involve vertical and diagonal movements of both the saccadic and pursuit types. Analysis of reading performance and reading problems made on the basis of the plottings of monocular fixations, or even on the basis of binocular fixations, is seriously questioned.

A further implication of these data is physiological in nature, for, in spite of the variation in fixation points and, therefore, in the "foveal image," none of the subjects reported any difficulty due to double images. Certainly one may draw conclusions regarding the causes of reading difficulties from visual, peripheral data only with the greatest care.

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THE EXTENT OF CLASSROOM QUESTIONING ACTIVITY OF HIGH-SCHOOL PUPILS AND THE RELATION OF SUCH ACTIVITY TO OTHER FACTORS OF PEDAGOGICAL SIGNIFICANCE*

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THE PROBLEM

Many writers have stressed the importance of the question as a factor in the learning process,[1–8,13–17] and some have regretted its tendency to disappear as children advance in age and educational status.[7,9,12,17] No one, however, has made a comprehensive study of questioning activity in high-school classrooms or the relationship between such activity and other objectively measured traits.

The present report is of an investigation of these problems. The study on which it is based sought to discover how much questioning activity occurs in high-school classrooms and what relationships exist between the questioning activity of individual pupils and such traits as intelligence, age, school grades, academic marks, interests, reading abilities, and several aspects of accuracy and consistency in thinking.

THE DATA

The data were collected by making verbatim records of all oral questions asked in six different high-school classes over a period of one academic year. Records were made in long hand by trained observers and the name of the questioner was recorded with each question. The reliability of this method of recording was found to be satisfactory by comparing the records so made with records made for a period of seven days in each of the classes by an expert stenographer. The regular reporters recorded all the questions recorded by the stenographer, recorded a few which the stenographer seemed to have missed, and, where discrepancies in word forms or sentence

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structures occurred, recorded contractions, figures of speech, and the like which appeared to be sometimes "smoothed out" in the stenographic records. This study was conducted in one of the high schools included in the Eight-Year Study of the Progressive Education Association. Through the courtesy of the high-school principal, the school records and records of the Eight-Year Evaluation Study test battery for each pupil were made available.[10,11]

The classes involved were seventh-grade science, eighth-grade history, ninth-grade science, tenth-grade English, eleventh-grade English, and an American history class of eleventh- and twelfth-grade pupils. One teacher taught both English classes but there were different teachers for each of the other classes. One hundred and sixty-nine children were involved.

The number of questions asked by each pupil was counted and frequency distributions made for each class and for the total group. The number of questions asked by each individual pupil was then correlated with each of the other variables. Both Pearson product-moment coefficients and correlation ratios were computed.

THE RESULTS

Table I summarizes the distribution of questioning activity. Such activity appeared to be marked more by its absence than by its presence. The median pupil of the group asked but 10.8 questions out of a range of from zero to two hundred thirty-three. The mean number of questions for the total group was somewhat greater, equalling 22.12, with a standard deviation of 31.36. As may be observed from an inspection of Table I, or from the discrepancy between the mean and the median, the distribution was markedly skewed.

Within the separate classes the ranges were generally great but the means and medians reflected what would seem to be a pedagogically significant dearth of questioning activity. The marked absence of questions in History 8 may be largely attributed to the use in that class of a supervised study technique and the impossibility of obtaining those questions asked in pupil-teacher conferences. There appeared to be no pattern of questioning activity corresponding to the subjects represented. The English classes, both taught by the same teacher, each produced about the same number of oral pupil questions. The two sciences differed markedly, and the two history classes were at the opposite extremes of the distribution.

TABLE I.—THE DISTRIBUTION OF THE TOTAL AMOUNT OF QUESTIONING ACTIVITY ENGAGED IN BY THE PUPILS IN EACH OF THE SIX CLASSES AND IN THE TOTAL GROUP

Class	Science 7	History 8	Science 9	English 10	English 11	History 11	Total
Number of questions							
230–234	.....	.....	.....	.....	.....	1	1
160–164	1	.....	.....	.....	.....	.....	1
130–134	1	.....	.....	.....	.....	.....	1
125–129	.....	.....	.....	.....	.....	1	1
110–114	1	.....	.....	.....	.....	.....	1
100–104	1	.....	.....	.....	.....	.....	1
85–89	.....	.....	.....	.....	.....	2	2
80–84	1	.....	.....	.....	.....	1	2
70–74	.....	.....	.....	.....	2	.....	2
65–69	.....	.....	2	.....	.....	.....	2
60–64	1	.....	.....	.....	.....	.....	1
55–59	2	.....	.....	.....	.....	1	3
50–54	.....	.....	1	.....	.....	1	2
40–44	.....	1	1	.....	.....	.....	2
35–39	3	3	.....	1	2	2	11
30–34	1	.....	2	.....	.....	1	4
25–29	3	.....	.....	4	1	1	9
20–24	1	1	3	1	2	2	10
15–19	2	1	4	3	.....	.....	10
10–14	4	7	1	6	3	1	22
5–9	4	6	3	10	6	2	31
0–4	7	15	6	13	4	5	50
Totals.....	33	34	23	38	20	21	169
Medians.....	18.75	6.67	16.88	8.00	10.00	27.50	10.00
Means.....	34.93	10.73	20.76	20.13	19.25	35.10	22.12
SD's.....	40.38	11.44	19.20	9.07	20.63	54.20	31.36

The same absence of correspondence may be noted as far as grade-levels are concerned. The least advanced and the most advanced classes produced the most questions, those between produced relatively few. Although the data at hand are not sufficient for any sweeping generalizations in this regard, it seems likely that the number of questions asked in a given high-school class is more the function of the method of teaching than of grade-levels or subjects.

Individual differences among questioners were great. Seven pupils, slightly more than four per cent of the total group, asked no

questions during the year and nearly thirty per cent asked less than five oral questions each. On the other hand, one pupil alone asked almost as many questions as did seventy-two other pupils. Contrasted with the four per cent who asked none, another four per cent of the group were the authors of over one-fourth of all the questions asked.

That some sex differences were evident in the classes and in the total group is indicated in Table II. Five of the seven pupils who

TABLE II.—THE MEAN NUMBER OF QUESTIONS ASKED BY BOYS AND BY GIRLS IN EACH OF THE SIX CLASSES AND IN THE TOTAL GROUP

Class	Boys		Girls		Total	
	Number	Mean number of questions asked	Number	Mean number of questions asked	Total	Mean number of questions asked
Science 7....	18	46.17	15	21.50	33	34.93
History 8....	16	12.25	18	7.95	34	10.73
Science 9....	10	23.60	13	18.31	23	20.76
English 10...	20	13.75	18	8.11	38	11.08
English 11...	16	16.75	4	37.50	20	19.25
History 12...	8	72.88	13	27.38	21	35.10
Total.....	88	27.15	81	16.68	169	22.12

asked no questions at all during the year were girls. At first glance it would seem that the boys greatly exceeded the girls in questioning activity. However, the difference was slight in Science 9, and in English 11, where there were four times as many boys as girls, the girls averaged more questions each than did the boys. The hypothesis that girls have matured more than boys during the high-school period and thus demonstrate the decrease in questioning activity which is supposed to accompany increase in age is not borne out in this study, since no relationship was apparent between amount of questioning activity and age.

The relationships between the extent of questioning activity and other variables considered in this study are summarized in Table III and elaborated upon below under appropriate headings.

Chronological Age.—The pupils observed ranged in age from eleven to twenty-two years. With the exception of the twenty-two year old girl who had been out of school because of illness, (and who asked five

TABLE III.—THE CORRELATION BETWEEN THE TOTAL AMOUNT OF QUESTIONING ACTIVITY AND EACH OF THE PUPIL VARIABLES AS MEASURED BY PRODUCT-MOMENT COEFFICIENTS OF CORRELATION AND CORRELATION RATIOS

Variables	r	SE	eta xy	SE	eta yx	SE
Chronological ages	.03	± .08	.39	± .07†	.12	± .08
Intelligence quotients	.21	± .07†	.75	± .03†	.26	± .07†
Grade in course	.19	± .07	.48	± .06†	.25	± .07†
Scholastic average	.18	± .08	.33	± .07†	.22	± .07†
"Likes" in subject	.29	± .07†	.40	± .07†	.37	± .07†
"Dislikes" in subject	−.30	± .07†	.49	± .06†	.74	± .04†
Mean "likes"	.10	± .08	.29	± .07†	.24	± .07†
Mean "dislikes"	−.18	± .08	.34	± .07†	.22	± .07†
Reading speed*	.29	± .10	.53	± .08†	.30	± .10†
Reading comprehension*	.18	± .11	.44	± .09†	.22	± .11
Reading appreciation*	.25	± .10	.46	± .08†	.35	± .09†
Consistency in social problems	−.05	± .08	.15	± .08	.28	± .07†
Consistency in "beliefs"	.17	± .08	.49	± .06†	.17	± .08
Inconsistency in application of principles*	−.25	± .10	.41	± .08†	.37	± .09†
Confusion in social problems	.00	± .08	.44	± .07†	.18	± .08
General accuracy in interpretation of data*	.32	± .09†	.47	± .08†	.52	± .07†
Accuracy in application of principles*	.23	± .10	.54	± .07†	.37	± .08†
Accuracy in social problems	.08	± .08	.41	± .07†	.16	± .08
Accuracy with insufficient data*	.36	± .09†	.50	± .08†	.57	± .07†
Accuracy with true-false*	.28	± .09†	.38	± .09†	.33	± .09†
Accuracy with probably true-probably false*	.03	± .10	.28	± .09†	.22	± .10
Tendency to be over-cautious*	.01	± .10	.25	± .10	.22	± .10
Tendency to go beyond the data*	−.27	± .09†	.38	± .09†	.32	± .09†

* Tests administered only in grades IX to XII (N = 102).

† Statistically significant only since r is 3 times SE.

questions during the year), the ages for each group were more or less typical. Rectilinear relationship was absent and such curvilinear relationship as existed may be traced back to the correspondence between ages and grade-levels and the probably accidental (at least, independent) fact that the oldest and youngest groups asked the greater number of questions, while the groups between asked relatively few. Any tendency for the amount of questioning activity to decrease with age was not apparent.

Intelligence.—The rectilinear relationship between intelligence and amount of questioning activity was barely significant statistically although the correlation ratios did attain statistical significance. At the lower end of the intelligence distribution questions were markedly absent and the average number of questions per pupil increased with increases in intelligence, but some pupils at all represented levels of intelligence asked few questions. The ten pupils with intelligence quotients below 90 averaged but three and one-half questions each; the twenty-five pupils with intelligence quotients above 130 averaged nearly twenty-nine questions. It would appear that intelligence and the tendency to ask questions were positively but not rectilinearly related.

Scholastic Achievement as Measured by Grade Received in Course in Which Observations Were Made.—There appeared to be a significant but slight positive curvilinear relationship between amount of questioning and grades received. This relationship was of such a nature that pupils receiving "B" grades asked most questions; those receiving "A" grades averaged at the mean of the total group; and pupils receiving "C," "D," or "F" asked fewer than an average number of questions.

Scholastic Average.—The relationship between scholastic average and quantity of questioning activity was of the same nature but even less marked than that involving grade in course. The reduced relationship was probably a result of the decreased variability of the scholastic average distribution.

Interests.—Four measures of interest were used from the Progressive Education Association *Interest Questionnaire, 8.2 Scale.* Pupils were given an opportunity to express both likes and dislikes in the subject. From these data means were computed. There was a significant positive relationship between "likes" in the subject and questioning and a corresponding significant negative relationship between "dislikes" in the subject and questioning. In both cases the curvilinear relationships were higher than the rectilinear, owing, no doubt, to the marked skewedness of the questioning activity distribution and of both the "likes" and "dislikes" distributions. The mean "likes" and mean "dislikes" measures may not be meaningful and bore a lower though similar correspondence to questioning activity.

There appeared to be a direct and progressive correspondence between a pupil's liking for a subject and the number of questions he asked in the classroom where that subject was taught. The relationship was not high enough, however, to permit prediction of amount of

oral questioning when interests are known or of interests when questioning is known.

Reading.—Both speed of reading and reading comprehension as measured by the *Iowa Silent Reading Test, Forms A and B*, bear a positive relationship to amount of questioning. Three of the correlation ratios were significant though not of great magnitude. Poor readers tended to ask few questions while better readers tended to vary markedly in the extent of their questioning activity. These relationships undoubtedly were related to the correspondence between questioning activity and intelligence.

The reading appreciation scores from the Progressive Education Association *Voluntary Reading* test correlated positively and significantly with amount of questioning. Those pupils scoring low in appreciation tended to ask few questions; those scoring high tended to ask relatively many more questions; those near the average varied widely in the extent of their questioning. The seven pupils who scored lowest in reading appreciation averaged less than five questions during the year; the six pupils who scored highest on the same test averaged forty questions during the same time.

Consistency and Confusion in Thinking.—Measures of consistency in thinking in social problems, consistency in "beliefs" (attitudes), inconsistency in application of principles, and confusion in social problems were based upon the Eight-Year Evaluation Study test battery. Consistency of thinking about social problems bore little relationship to amount of questioning; consistency in "beliefs" was slightly correlated positively; inconsistency in application of principles bore a negative relationship which in terms of correlation ratios was statistically significant; confusion in social problems bore no rectilinear relationship to questioning but did produce one significant correlation ratio resulting from an almost *C*-shaped distribution of the confusion means along the questioning distribution and caused by the high confusion scores made by those pupils who questioned most frequently. The five pupils averaging more than one hundred questions each averaged one and one-half standard deviation units above the mean of the confusion distribution. Below this group the correlation was slight and tended to take the opposite direction toward the lower end of the confusion distribution. It would appear that relatively frequent questioning may be a result of a high degree of confusion as measured by this test, but that the two are not of necessity associated.

General Accuracy.—Three general accuracy scores were considered —general accuracy in application of principles, general accuracy in interpretation of data, and accuracy in social problems. General accuracy in the application of principles bore a significant and positive relationship to amount of questioning. Pupils scoring highest on this test tended to ask most questions, but some pupils at all levels of accuracy scores made few or no inquiries. The relationship between amount of questioning activity and accuracy in interpretation of data was of the same general nature as in the case of application of principles but was slightly higher. Questioning bore little relationship to accuracy with social problems except as indicated by eta *xy*, the regression of the accuracy means along the questioning distribution. In this case there appeared to be a slightly positive relationship above and a slightly negative relationship below the intersection of the means, but with considerable variability at all points.

Special Measures of Accuracy.—The *Interpretation of Data* test purportedly measures accuracy of interpretation with items containing insufficient data, accuracy with items which are true or false, and accuracy with items which are probably true or probably false. With the first two of these measures amount of questioning was positively related to a significant degree, but with items probably true or probably false the relationship was low and insignificant.

Tendency to Be Over-cautious or to Go beyond the Data.—Tendency to be over-cautious, as measured in the *Interpretation of Data* test, reflects a reluctance to ascribe complete truth or falsity to given data or inferences drawn from such data. There was no significant relationship between this trait and the tendency to ask questions in the classroom. Tendency to go beyond the data, as measured by the same test, in the direction of ascribing greater truth or falsity than is justified to given data or inferences drawn therefrom was negatively related to the tendency to ask questions. The rectilinear relationship was barely significant. The curvilinear relationship was such that below the mean of the questioning distribution and above the mean of the beyond-the-data distribution there was a rather close correspondence. At the other end of each distribution there was little or no relationship.

SUMMARY AND CONCLUSIONS

All the questions asked by one hundred sixty-nine pupils in six different high-school classes during one academic year were recorded,

summarized and correlated with other pupil traits of pedagogical significance. An analysis of the data suggests the following conclusions:

(1) The pupils represented in the study asked very few questions, averaging approximately one question per pupil per month. If assertions with respect to the merits of the question as a factor in the thinking process are well-founded, and if these pupils were typical, classroom questioning activity must be greatly stimulated before such merits can be realized.

(2) Individual pupils differed markedly in the amount of oral questioning in which they engaged. Although few questions were the rule, eighteen pupils asked five times the median number of questions, one pupil asked over twenty times the median number. One-third of the group asked less than six questions each during the year, while four per cent of the group asked twenty-five per cent of the questions.

(3) There were marked differences in the amount of questioning activity in different classes, but such differences bore no appreciable relationship to school subjects, grade-levels or chronological ages. Probably the teacher and the teaching methods contributed most to these differences.

(4) Although the sexes were approximately equally divided, the boys contributed nearly two-thirds of the total number of questions.

(5) There was a persistent tendency for more favorable scores on measures of scholastic achievement, interests, reading abilities and appreciation, and accuracy and consistency in thinking to be associated with greater amounts of questioning activity and, conversely, for greater scores in the unfavorable aspects of such traits to be associated with lesser amounts of questioning activity. Several of the rectilinear coefficients and many of the correlation ratios expressing such relationships attained statistical significance. In spite of this, however, it is doubtful if any of the relationships were sufficiently great to imply pedagogical significance unless it be with the regression of intelligence on the questioning distribution or with the regression of the amount of questioning activity on the "dislikes" in the subject distribution.

(6) There are undoubtedly other factors involved in the classroom situation which contribute more to individual differences in amount of questioning activity than do any of the variables considered in this study. Among such other factors, the methods and personalities of

teachers and the study habits and social and emotional traits of pupils would probably rank high.

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THE RELATIONSHIP BETWEEN READING ABILITY AND INTEREST SCORES

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STATEMENT OF PROBLEM

Vocational guidance has been gaining wider recognition and receiving increasing attention on both the high-school and college level ever since the time of the first National Conference on Vocational Guidance, which was held in Boston in 1910. Both the increasing hetrogeneity of the student population and the increasing complexity of the business world have had their share in making those responsible for the affairs of the school aware of the need for helping students make a satisfactory occupational adjustment.

The tools available to the vocational counselor after these thirty-two years, however, are still inadequate. Tremendous advances have been made in testing and in counseling techniques, no doubt. Nevertheless, the vocational counselor cannot, and likely never will be able to, predict or advise with certainty what specific occupation a student should enter to find the most success and happiness. Because of this uncertainty, errors are made and students are advised to enter positions where they will find neither happiness nor success. The unhappy, unsuccessful worker is a liability to his employer. He cannot render services commensurate with what he is paid, and he may find himself out of that job and unprepared for any other type of employment. He is then a burden not only to himself but may shortly be a burden to society as well. In addition to becoming an economic burden to society through unemployment, his physical or mental health may break because of the frustrations and nervous tensions he has experienced, thereby becoming an additional and perhaps even a permanent burden to society. If it were possible to perfect the existing counseling instruments or add to them so that the counselor could work with more confidence and precision, it would be of great personal, social, and economic value.

At the present time, perhaps the most common tools or techniques used by the vocational counselor in trying to reach an understanding of the student and in trying to interpret him in terms of occupational requirements are:

(1) Intelligence or psychological test scores.
(2) High-school or previous school records.

(3) Teachers' ratings.
(4) Interest test scores.
(5) Achievement test scores.
(6) Prognostic or aptitude test scores.
(7) Data accumulated through interviews.
(8) Anecdotes of observations or incidents.
(9) Personality, attitude, etc. test scores.
(10) Results of health examinations.

With this information available for each student, the next step taken by the vocational counselor is an attempt to reconcile the qualifications of the student with the job specifications or qualifications which were arrived at through careful job analysis. By matching up or reconciling individual qualifications with job qualifications, the counselor should be able to arrive at a tentative decision as to which job or jobs in which the student would be most likely to be happy and successful.

Although, as was stated above, it may never be possible to predict with absolute accuracy the one best job for each individual (in fact, it is not yet ascertained that there is just one best job for each individual), it will, nevertheless, be possible to help the individual student arrive at a choice compatible with his known qualifications—a choice in which he should be more likely to succeed than in a choice based merely on chance.

Vocational counselors are never going to be able to set aside the human element in their counselees. It is this human factor which makes absolute precision and infallibility in advising impossible. Sometimes a driving interest or motive will make up most unbelievably for a lack of known qualifications. Sometimes a lack of interest or motivation will make a failure out of those who apparently have all the requisites for a given job. However, aside from the human element, the more we know about the student and the more we know about the relation of those qualifications to the requirements of the job, the smaller the margin of error in our advising will become. It is to this end that this study is directed.

PURPOSE OF STUDY

Since in attempting to help students arrive at a vocational choice it is necessary to bring into play every factor which might provide a lead toward a satisfactory choice, it seemed that it might be worth while to determine what relationship exists between reading ability

as shown by scores on the Iowa Silent Reading Test and occupational interests as indicated by scores on the Strong Vocational Interest Blank. No research has been done in this connection and no information is available as to any relationship which might exist. It was felt that if a significant relationship were found to exist between certain occupations and reading ability it might prove to be an additional, helpful bit of evidence to add to the information already available in counseling students in their vocational choice.

LIMITATIONS AND PROCEDURE

Since all entering freshmen at Stanford University are given the Iowa Silent Reading Test, and since a number of them have filled out the Strong Vocational Interest Blank as well, it was decided to use the results of those tests. There are other reading tests which could have been used, e.g. (Minnesota, Traxler, etc.) and other vocational interest tests which could have been used for a study of this kind, e.g. (Cleeton, Manson, etc.), but the foregoing tests were already given and the results available.

It was not possible, within the scope of this study, to include all the students at Stanford University who have filled out the Interest Blank, nor even to include all the interest scores shown on each blank; therefore, it was necessary to make certain delimitations. After carefully considering the available material, the following limitations were set:

(1) The accessibility of the material made it seem expedient to work with scores of Stanford students, and, further, with women students since their files were readily accessible in the office of the Dean of Women.

(2) Since it was not possible to work with the entire group of women students in Stanford University who have filled out the Strong blank, it was decided to work only with the group who are in school now and who had filled out the blank while they are, or were, still in lower division. This decision was based on the fact that:

(*a*) The reading test, which was also to be used in this study, was given at the beginning of the freshman year, and, therefore, Strong blanks filled out while the students were still in lower division might be more comparable than those given after the student had been in school longer.

(*b*) Since one real value which might accrue from this study is the help it would give in counseling students in their choice of a vocation, and, therefore, a major in college, it would seem best to have this information available for students before they enter upper division.

(3) Because it was not feasible to use all the interest scores on the Strong blank, it was decided to tally the highest scores on one hundred blanks, drawn from the file at random, and on the basis of this distribution, work further with those four interests which proved to occur in first place most frequently. Table I shows the way these vocational interests were distributed.

TABLE I.—MAJOR VOCATIONAL INTEREST OF ONE HUNDRED WOMEN AS INDICATED BY STRONG VOCATIONAL INTEREST BLANKS

VOCATIONAL INTEREST	NUMBER OF CASES
Stenographer	30
Nurse	17
General Office Worker	14
Social Worker	10
Lawyer	7
Librarian	6
English Teacher	6
Mathematics Teacher	5
Physician	3
Social Science Teacher	2
Total	100

Since the Strong scores were given in terms of standard scores and the Reading scores were in percentiles, the Reading scores were also transmuted into standard scores by means of Holzinger's Table XI, "Areas and Ordinates of the Normal Probability Curve in Terms of Deviates from the Mean."[1]

The group to be studied, therefore, represents all the women students now in Stanford University who filled out the Strong blank as lower division students. The only exception to this statement is three cases which were disregarded because there were no reading scores available. As a result of a thorough search through the files, seventy-two cases were found for the study.

The occupations to be used are those which occurred most frequently as highest score on the one hundred Strong blanks, *i.e.* Stenographer, Nurse, General Office Worker, and Social Worker.

After the scores on reading rate and comprehension were recorded for each student, together with his score for each of the four vocations selected for the study, a scatter diagram was prepared for each occupation and reading rate, and for each occupation and reading comprehension. From this diagram, in each case, a correlation was computed by the Pearson Product-Moment method.

[1] Holzinger, Karl J.: *Statistical Tables*, pp. 70–71.

FINDINGS

The correlations which resulted from these computations are presented in Table II.

TABLE II.—CORRELATION BETWEEN VOCATIONAL INTEREST AS INDICATED ON THE STRONG INTEREST BLANK AND READING RATE AND COMPREHENSION AS INDICATED BY THE IOWA SILENT READING TEST

Vocational interest	Reading rate	Reading comprehension
Stenography	−.33	.23
Nursing	−.23	−.26
General Office Work	−.26	−.23
Social Work	.16	.10

CONCLUSIONS AND SUGGESTIONS

It is quite obvious from these low or negative correlations that there is no value in knowing a student's reading ability so far as concerns predicting his vocational success, at least, in these four occupations. Interest scores alone are as meaningful as interest scores plus reading scores. This lack of correlation may be explained partly as follows:

(1) The particular occupations which were chosen for this study may be less related to reading ability than other occupations which might have been included. Perhaps, if reading scores were correlated with such occupations as lawyer, English teacher, etc., which appear on the Interest blank, occupations which seem more "academic," higher correlations might result. In fact, with the exception perhaps of Y.W.C.A. secretary, life insurance saleswoman and housewife, the thirteen occupations on the Interest blank which were not included in this study all seem to be professional occupations for which reading ability might be more closely related.

(2) Interest in an occupation does not necessarily mean ability in that occupation; and, therefore, we would not necessarily expect a high relationship between these two scores. Strong feels that ability and interest are related, but he states that we do not know to what extent as yet.[1]

[1] Strong, E. K.: "Aptitude *vs.* Attitude in Voc. Guidance." *Jr. of Applied Psych.*, Vol. XVIII, pp. 501–515.

It might be worth while to have a more complete study made which would include the remaining thirteen occupations scored on the women's blank. This would indicate if higher relationships exist in those occupations where a more academic training is required—training more dependent on reading ability. It would be particularly interesting to have such correlations worked out for the men's blank where a wider range of occupations has been developed. Whereas, only seventeen occupations are scored on the women's blank, thirty-four are scored on the men's blank, ranging from artist, psychologist, architect, dentist, engineer, etc. down to carpenter, printer, policeman, etc.

It might be worth while, too, to repeat the reading test near the end of the sophomore year and correlate that score with the score on the interest test. Since the score on the reading test would be likely to change during two years in college—in fact, almost certain to show a considerable increase—and the score on the interest test remain much the same, some change in the correlation between reading ability and interest would be inevitable. Relatively little change would be expected to occur in the interest scores themselves or in the relative ranking of the occupations during these two years; and, therefore, the original interest score could be used. However, the test might be repeated and some differences in scores or rankings found, particularly if the student were quite young when he took the test the first time.

From the standpoint of practical help to the vocational counselor, nothing positive has been gained in the matter of the value which was hoped to be realized from this study. The results of this study indicate that even though reading test scores may be available, there is no need for the counselor to consider them in predicting success in an occupation. His prediction would be no more accurate than if he used interest scores alone—at least in the four occupations studied here.

This study, therefore, has added nothing to the tools of the counselor. In this respect the study was not fruitful. On the other hand, however, if further studies were carried out, as suggested, some positive results might be obtained. In any event, it is through such attempts as this—such efforts to bring together all possible, known information about the student and discover its relationship to occupational success—that further success in vocational guidance will be made possible.

A NOTE ON THE EFFECTS OF PRACTICE UPON TRAIT DIFFERENCES IN MOTOR SKILLS

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INTRODUCTION

Such studies as those of Perrin,[11] Muscis,[8] Seashore,[12] Griffitts,[4] Buxton and Humphreys,[2] and Patterson and Elliott[9] have served to emphasize the specificity view of motor skills. Buxton and Humphreys have gone further and pointed out that practice tends to reduce the small intercorrelations observed to exist between various tests of motor abilities. These authors concluded that their results were inconsistent with any theory of a "general motor ability," and they re-emphasized the specificity view and the attendant advantages of direct training. An implication of their findings is, of course, that trait differences in motor skills increase with practice.

These investigators were not concerned with this latter problem, so it constitutes no criticism of their work for the writer to point out that the usual correlational technique is an inadequate crutch in this context.[5] The decline in an average intercorrelation with practice could as well be due to a decrease in the reliabilities of the tests concerned as to a lowered intrinsic relationship.[10]

The present paper, therefore, deals with an illustration of a quantitative method for determining whether practice causes a convergence of motor traits towards a common level of proficiency, whether a divergence occurs, or whether the *status quo* is maintained.

AN ILLUSTRATIVE CASE

Problem.—To determine the effect of practice upon trait differences in motor skills.

Method.—In order to evaluate differences between traits, it was first necessary to possess equated norm distributions for the several functions to be measured. The Minnesota Mechanical Ability Study[9] gives norms for over two hundred subjects on tests of motor skills. Seven of these tests were selected for use in the present investigation. The norm or master distributions for these functions were tested and normalized where necessary. The means and standard deviations were then equated on a scale similar to McCall's "T scale."[7] Scores of all subjects in the present experiment were interpreted as of these equated norm distributions.

Hull[6] has suggested that trait differences tend to be normally distributed. If further research should verify this conclusion, it would be ideal to combine estimates of trait differences for a number of persons in terms of standard scores obtained from a "trait distribution" for each individual. This scaling would tend to insure equal units of measurement, as pointed out by Anastasi.[1] Since the number of traits tested in the present case was so small, this technique was not feasible.

The issue of establishing a zero point on the scale of measurement was obviated, since it was proposed to employ the analysis of variance which deals only with deviates or differences and not with absolute magnitudes.

The statistical treatment accorded the scores is schematically illustrated in Table I.

TABLE I.—EFFECT OF PRACTICE ON T.D.'S

	Administrations—subject *E*					
	II	III	IV	VI	VII	VIII
Block packing	345	436	463	503	428	444
Steadiness	370	370	306	370	370	471
Slow movement	512	618	583	663	723	730
Etc	...	...	...	...	...	...

Factor	Degrees of freedom	Mean square	Degrees of freedom	Mean square
Total V	17	.....	17	.....
Trait D.'s	5	42,683.02*	5	52,384.63†
Admin. D.'s	2	4,034.89	2	3,408.17
Error	10	1,287.29	10	1,483.50

* $F = 33.16$ = highly significant.
† $F = 35.31$ = highly significant.

The analysis of variance was applied with two criteria of classification—administrations and function, or traits. The administrations were dichotomized—two through four *vs.* six through eight—so that two analyses yielded two independent estimates of the magnitude of trait differences. Sums of squares and degrees of freedom for the parallel analyses of each individual were ultimately totalled to yield

summary statistics on the initial (2–4) and final (6–8) magnitudes of trait differences. This totalling was done on the assumption that all deviations were about a common grand mean.*

The subjects for the present experiment were fifteen junior-high-school boys matched for age, intelligence and race, both with each other and with the norm group employed. They were otherwise unselected, to the writer's knowledge. Each subject received eight administrations of seven tests of motor skills. The tests were administered in systematically varied order on a schedule calling for about eight hours of each subject's time.

Results.—Further research may verify these results and show that trait differences in the motor realm remain constant, or even increase, with practice. It might be hypothesized that the motivation available for a given task is proportional to the success attained in its performance. In any case, this study concurs with the trend of previous investigations stressing the apparent genetic determination and uniqueness of motor skills. In addition it seems to indicate the theoretical efficiency of early specialization along the lines of the individuals greatest aptitudes as pertaining to the realm of manipulative skills.

TABLE II.—PRACTICE AND T.D.'S—SUMMARY

Factor	Degrees of freedom	Sum of squares	Per cent	Mean square	"*F*"	*P*
		(Administrations 2–4)				
Total V.....	255	2,828,723.05	100			
Trait D.'s$_1$.....	75	2,441,890.33	86	32,558.54	18.68	.01
Admin. D.'s.....	30	125,390.68	5−	4,179.68	2.40	.01
Error.....	150	261,442.04	9	1,742.95		
		(Administrations 6–8)				
Total V.....	255	2,861,646.86	100			
Trait D.'s.....	75	2,552,178.81	88	33,629.05	18.22	.01
Admin. D.'s.....	30	62,656.82	2+	2,088.56	1.13	.05
Error.....	150	276,811.23	10	1,845.41		
	$t = \frac{\text{T.D.}_2 - \text{T.D.}_1}{\sigma_D} = 0.12$ and P. = .50					

* The same result may be achieved by establishing the proportion of the total variance contributed by trait differences in each analysis. The two series of proportions may then be transformed as of a normal distribution[3] and tested as to the presence of a significant difference between their means.

The Conclusion.—In this population and with respect to these functions, trait differences tended to remain constant when subjected to systematic practice.

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BOOK REVIEWS

NEAL E. MILLER AND JOHN DOLLARD. *Social Learning and Imitation.* New Haven: Yale University Press, 1941, p. 341.

Because they were convinced that sociologists have hitherto made insufficient use of learning theory, Miller and Dollard, the former a psychologist and the latter a sociologist, have elaborated at length the bearing of certain principles of learning upon social phenomena. These principles come almost exclusively from the hypotheses developed by Hull and his students in the Institute of Human Relations. The authors state: "The analysis proposed here . . . derives from the work of Pavlov, Thorndike and Watson. . . . Its best current statement and synthesis have been made by Hull" (p. 91).

The first five chapters consist of a systematic and thorough discussion of the learning principles that are subsequently used to explain imitation. The basic *sine qua non* learning factors are represented to be: (1) Drive, (2) response, (3) cue, and (4) reward. To the reviewer, these four factors seem to be basic to all behavior as well as to learning. The authors are correct in their analysis but they do not go far enough in that they fail to differentiate adequately behavior in general from learning. The significance of changing behavior as characteristic of learning is not stressed nor is the importance of the obstacle that makes change necessary.

Cue and drive are distinguished primarily in terms of the strength and distinctiveness of the stimulus (p. 54, passim). A stimulus that is strong has drive value while a stimulus that is distinctive has cue value. Hunger as a rather gross urge to activity is a drive, while food or the sight of a restaurant or the sound of a dinner bell are cues. The authors admit that this dichotomy is incomplete and that some stimuli act simultaneously as drive and cue.

An elaboration of the above mentioned, fundamental learning factors is followed by a discussion of these "significant details": (1) Extinction, (2) spontaneous recovery, (3) generalization, (4) discrimination, (5) gradient in reward effect, and (6) anticipatory response. These concepts constitute the framework in which imitation is examined. The authors conclude that "The evidence seems to show that imitative behavior follows the laws of learning and arises under the social conditions which reward it," (p. 12).

Miller and Dollard did not attempt any complete discussion of drives to action, although Chapter IV, "The Basis for Acquired

Drives and Acquired Rewards," as well as much other incidental discussion implied their assumption that the reader was familiar with the nature of fundamental tissue needs. A valid and practical distinction was made between acquirable (*sic*) drives such as anxiety or fear and primary drives such as pain. "The physiological reactions producing the sensations of anxiety can easily be learned as responses to new situations while those producing the original pain cannot," (p. 61). This quotation becomes somewhat clearer when the reader is told that the word "response" is here used to mean "any activity within the individual which can become connected with an antecedent event through learning." Despite his expectations, the reviewer found few comments on the complexity of human motivation. He felt, on the contrary, that the argument rather consistently implied that drives operated *seriatim*.

Imitation itself was defined as "a process by which identical or similar acts are evoked in two people and connected to appropriate cues," and the contention was that, "This can occur only under conditions that are favorable to learning these acts," (p. 10). This generalization that imitation is learned was supported by these experiments:

(1) Different groups of rats running a modified elevated maze were rewarded for imitating or not imitating leaders. Both types of behavior were successfully learned and generalized to another situation involving a different type of maze. No constant initial tendency toward imitativeness or nonimitativeness was discernible.

(2) Different groups of first-grade children were successfully trained to imitate or not imitate a leader in a simple candy procuring situation. These habits also were generalized so that they carried over to different situations.

One of the important conditions in the learning of imitation is the presence of marked variation among individuals in the degree to which they have learned to make independently those responses which are most likely to be rewarded. This was illustrated by comparing the behavior of children of different ages. A child who imitates an older, more experienced child is more apt to be rewarded than he would be if he imitated one who was younger and less sophisticated. This hypothesis was tested experimentally by successfully teaching children to follow one of two leaders when the two could be readily differentiated by distinctive cues and when imitating only one led to a reward.

This learning was also generalized so that: (*a*) The children followed or imitated new "leaders" who were similar to the previously imitated leaders, and (*b*) the leaders who were successfully imitated in one situation were imitated in a subsequent different situation.

Generalizing further upon this prestige element the authors aver that there are at least four classes of persons who are imitated by others (p. 183): (1) Superiors in an age grade hierarchy, (2) superiors in a hierarchy of social status, (3) superiors in an intelligence ranking system, and (4) superior technicians in any field. The explanation for imitating these groups is again learning. Doing the same things as one's superiors, however defined, leads more often to reward than to punishment. For the same reason, nonimitation of inferiors is consciously practices by many persons. Miller and Dollard explain "following the crowd" in terms of the same principles that they use to explain imitation. Conformance with crowd behavior is apt to be rewarded and nonconformance punished.

One of the very interesting features of the book is an appendix in which is summarized a large number of theories bearing upon the nature of imitative behavior. The theories, in terms of their authors, are classified under these four headings: First, writers such as Bagehot, C. L. Morgan, MacDougall and others who stress the instinctive nature of imitativeness; second, associationists like Pavlov, Baldwin, Guthrie and others; third, psychologists who stress the learnedness of imitative behavior as a consequence of reward and punishment, and this group includes Thorndike, Jersild and Dewey; and fourth, an unclassifiable group of eclecticians like Joseph Peterson, Taylor and Cooley.

Miller and Dollard have written a scholarly book which will be studied by sociologists and psychologists alike. The former will be more stimulated by the elaboration of a plausible learning theory and the latter by the social implications of this theory. Despite the willingness of the authors to demonstrate many of their principles by reference to "a child and a piece of candy," the book is by no means easy reading. It must be studied to be understood. The authors themselves give the impression of being in the process of thinking through a series of important problems. *Social Learning and Imitation* is claimed to be only a progress report: "Like every scientific hypothesis this one is viewed as a beginning rather than a terminus to others in the field," (p. vii).

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GUY L. BOND AND EVA BOND. *Developmental Reading in High School.* New York: Macmillan Company, 1941, pp. 363.

During the last few years high-school teachers and administrators have progressively come to accept the view that improvement in reading skills at the secondary-school level is needed if educational progress is to be maintained at an adequate level. Although this difficult responsibility for aiding students to develop more proficient reading may be generally acknowledged, there is at present little organized instruction in reading in high schools. This appears to be due largely to the fact (1) that most teachers do not know how to give such instruction and (2) that administrative organization for such a program is still lacking in most schools. This practical book, written for high school teachers, provides basic information, a systematic program (developmental reading), and description of techniques which will help greatly to make teaching of reading in the high school an actuality. After pointing out the need of reading instruction in the high school, and basic considerations determining the nature of such a program, sections are devoted to the all-school reading program, the program for the retarded reader, and coördination of the program.

The keynote of the book is given by the phrase "developmental reading program." It is based upon the recognized fact that "growth in the ability to use and understand speech is a developmental process." As the child progresses through the elementary grades this ability is fostered by systematic training in the techniques which promote adequate growth in reading proficiency. In the secondary school the reading program, to be adequate, must continue to refine and develop the more mature aspects of the abilities considered at the elementary-school levels. In addition, attention must be given to the newer demands made by the high-school curriculum, *i.e.*, reading in the content subjects.

Special notice may be given to certain contributions in this text: (1) The basis for the developmental reading program is psychologically sound. Growth in the sequence of reading skills progresses naturally from the abilities already learned to the new ones. Possibly more explicit emphasis than the authors give might have been placed upon reading readiness. Development of proficiency in reading at each level should be considered as preparation for the next higher or more complex level in the sequence. (2) Desirable stress is placed upon

the need for specialized reading instruction in the new content materials encountered in high school. In the absence of adequate experimental data in this area, the authors have outlined a program which appears basically sound and workable. (3) The authors correctly advise against the training of eye movements, photographing eye movements and the use of other elaborate apparatus for either diagnostic or instructional purposes. (4) Adequate emphasis is given instruction in oral reading. This is a desirable shift from past tendencies to minimize or ignore completely oral reading instruction. (5) The danger of devoting undue attention to the mechanics of reading is noted. A balance between mechanics and thought-getting is advocated. The reviewer feels that even greater stress might have been placed upon the rôle played by thinking in reading. The view that "reading is thinking" is sound. (6) Methods for grouping as an aid in reading instruction and individualization of teaching are clearly stated. (7) The sections on diagnostic and remedial procedures are exceptionally well done. (8) Although the references are highly satisfactory, the reviewer believes that some supplementary citations of materials (*a*) which give techniques for teaching skimming, word analysis, etc., and (*b*) which may be used for practice in various types of reading, would be useful. (9) The suggestions on coördinating the reading program are to the point. Even though the importance of reading instruction in the high school is generally accepted and the teachers may be trained to do it, little progress will be made until an adequate organization for the reading program is provided.

From the standpoint of the teacher, this text is one of the best books on reading that has appeared. It is well organized, clearly written, and highly practical.

MILES A. TINKER.
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H. B. ENGLISH AND V. RAIMY. *Studying the Individual School Child: A Manual of Guidance.* New York: Henry Holt and Co., 1941, pp. 131.

This manual, written for teachers and prospective teachers, has three aims: (1) To give "body" and reality to the psychological study of school children, (2) to help the teacher learn to use psychological principles and procedures, and (3) to give the prospective teacher some practice in using certain technical psychological procedures which should be at his command. The first aim is the most important.

Prospective teachers learn about children by making a detailed case study of a child from a longitudinal (developmental) and dynamic point of view. The major content of the manual is devoted to the making of this case-history. One part deals with the methods of obtaining data (direct observation, rating scales, interviewing, etc.), and "the other with appraising, interpreting and organizing the material so that its meaning is clearly evident." Data obtained are classified under the headings: Intellectual development (tests, achievement, abilities, interests, etc.), physical development, social development (child's relations to his parents, sibling influences, classroom and neighborhood behavior, etc.), and character ('the organization and integration of all a person's action tendencies in the service of goals which the person accepts as desirable for himself'). Emphasis is placed on obtaining a comprehensive and meaningful picture of the whole child.

The manual is written for the student; the topics selected and the length of treatment accorded them are results of the student's needs as discovered by the authors. The aim is to suggest how to observe rather than what to observe. The table of contents is unusually detailed to facilitate rapid reference. Explicit directions are given for making the initial contacts with the school, the home, and the child. The art of observing and its pitfalls are thoroughly discussed and the distinction between fact and interpretation is sharply pointed. Answers will be found to any questions a student may ask, from making the case-history to how to write the final report.

The weakness of the manual is its failure to consider more fully the less apparent, but vitally important, inter-familial relationships. These are less objective than test scores but just as, if not more, meaningful in understanding the "whole child." It is difficult to obtain data about a child's relationships to his parents and siblings and even more difficult to interpret them, but that is no reason for giving less attention to them. Perhaps, in this area the students will need help in learning what to observe despite the authors' emphasis on how to observe. They should be sensitized to psychological subtleties. The "Sample Case Study" in the Appendix is a beautiful illustration of how hollow and sterile a study of a child can be when such vital data are ignored or receive too little attention.

This manual will undoubtedly be welcomed by those responsible for teacher-training. Educators realize that a "good" teacher must understand the child as well as know how to teach him. Giving

the prospective teacher a broad, vital understanding of the child poses a difficult problem for pedagogy—the authors have considerably aided its solution.

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The Ohio Teaching Record. Anecdotal Observation Form (Revised Edition). Columbus, Ohio: College of Education, Ohio State University, 1941, pp. 32.

Although it may bear some resemblance to both, this record form is not primarily a rating scale for teachers nor an attempt to objectify observations of teachers. It "is intended for use in a coöperative inquiry carried forward by teachers and competent, informed observers, whose purposes are concerned with the improvement of teaching."

The record booklet is organized into three sections, the first of which includes several pages of instructions and cautions in the use of the instrument. The second section contains eight observation guides, all of which are similar in form, consisting of one page of suggested items which should help the observer to notice specific factors of teacher competency and a facing page on which the anecdotal recordings may be made. The third section contains suggestions and questions which might lead to two different but complementary summaries of the anecdotal records, one of them based upon a well-developed set of criteria of teacher success.[1]

The record form has been criticized by more than eight hundred individuals and has been tried out with six hundred teachers. It is reported that the teachers who were observed felt that the record form contributed greatly to the interview which followed with the supervisors, and further that "they didn't mind the writing of notes in the booklet while they were teaching." Early in the development of the form, the hope of securing an instrument which would yield information on the quality of teaching on the basis of only one observation was discarded. The present form leaves spaces for three observations of a teacher and it is implied that at least six are necessary in order to get a true picture of the teacher's work.

While they feel that they have developed the instrument carefully and well, the authors are ultra-conservative in their claims for it, and hope to revise it further as criticisms and suggestions by users of the form come to their attention. In the opinion of this reviewer,

[1] *Some Major Factors in Competency for Teaching.* College of Education, Ohio State University, 1941, 6 pp. Mimeographed.

the instrument is likely to be valuable only when used by a highly competent supervisor. It is not designed for use by novices.

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E. J. SPADINO. *Writing and Laterality Characteristics of Stuttering Children.* New York: Bureau of Publications, Teachers College, Columbia University, 1941, pp. 74.

Stuttering children do not differ from non-stuttering children in writing, laterality, and composition tests except in rare cases. That, in very general terms, represents the findings of Spadino's study on the subject. The results are based on an investigation of seventy stuttering children and a control group of seventy non-stuttering children. The series of tests used by the investigator included tests of English composition; handwriting skill; intentional mirror writing; bimanual simultaneous drawing; laterality which included handedness, eyedness, and footedness; mirror reading; orientation; and perception. In addition to reporting his conclusions, the author in his earlier chapters briefly reviews the more relevant literature concerning the relationship of stuttering to laterality, handwriting, and composition.

Negative conclusions can be highly worth while if they clear disagreements and uncertainties in a field or clarify the reality of the situation. Whether this study does either is doubtful. The conclusions are based purely on statistical treatment. For example, the laterality of a stuttering child is compiled with the laterality of other stuttering children and compared with non-stuttering children. Investigated, that is, were the handedness, footedness, or eyedness of stuttering and non-stuttering children, not stuttering children. As a result all one can say about the negative results is that this study, more so than previous ones, apparently shows no statistically significant differences between stuttering and non-stuttering children on the twenty factors investigated.

Much ado is made about a supposed discrepancy with the findings reported by the reviewer on a study made comparing the speech characteristics of fifty stuttering and fifty non-stuttering children by the use of the Rorschach ink-blot test where a statistically significant difference was found in favor of the stutterers talking more. This study for some unknown reason is listed by the writer as a handwriting test. The only handwriting done in that study was by the investigator, not by the stutterer or non-stutterer with whom he was

compared. This is cited by the investigator as being in disagreement with the study of Eisenson, who found in a study of twenty-five stuttering and non-stuttering college students that stutterers wrote fewer words whereas in Spadino's study, where children were the subjects, the difference found was statistically not significant. There may be some need for explaining such disagreement as there is between Eisenson's and Spadino's studies on that particular feature, since the measure they used was the number of words written in a composition. But it seems somewhat absurd to call a difference between speech characteristics and composition characteristics a discrepancy; the only discrepancy is in the author's attempt to compare two studies that do not use the same point of reference. This in itself may be enlightening in that it might reveal the fact that, perhaps, it is more worth while to study stuttering children as such and the personality organization of such children than to study fragmentary characteristics that in literature have been reported to be related to stuttering.

H. MELTZER.

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J. F. BROWN. *The Psychodynamics of Abnormal Behavior.* New York: McGraw-Hill Book Company, 1940, pp. 484.

Dr. Brown has written a good textbook of abnormal psychology, but almost exclusively from the psycho-analytical point of view. For this reason, its use in the classroom will likely be limited to the disciples of Freud. While the reviewer does not share the author's complete acceptance of Freudian psychology, the author is certainly entitled to his views and should be commended for his expert presentation of a difficult topic. Excluding the pros and cons of psychoanalysis, there are some other points of disagreement.

Lombroso's theory of the intimate relationship existing between genius and insanity is revived. There is the customary listing of a few great men who were neurotic, with the complete omission of the much longer list of even greater men who were of sound mind. Among British men of genius, Havelock Ellis found an incidence of mental disease of less than five per cent as compared with the expected rate of from five to ten per cent for the unselected general population. The section on psychiatry is particularly weak. The psychoneuroses and the functional psychoses are all disposed of in a total of thirty-seven pages with six pages allotted to the field of mental deficiency. All three combined are given less space than that devoted to the elabora-

tion of psychosexual theories. This one example serves to illustrate that the emphasis throughout the book is not on abnormal behavior, but its psychodynamics.

JAMES D. PAGE.
Temple University.

A High School Reading Program. Maryland State Department of Education. Baltimore: Twentieth Century Printing Co., pp. 127.

It is the opinion of the two English teachers who have examined for me *A High School Reading Program,* issued by the Maryland State Department of Education, that this book is an approach to a problem now recognized and long neglected in practically all high schools. The method of presenting the material here is excellent. It is put down in a clear, logical, and comprehensive style. The bibliography is complete enough to show the fact that the author has covered the reading field extensively.

On the other hand, this book would not be of any great aid to the reading teacher, as it sets up no real remedial program. No specific helps in providing correction in reading are given. The analysis of reading difficulties is excellent, but nothing really new and constructive to remove those difficulties is presented.

There is, however, much information of value in the book and it should serve well as a reference but not as a teaching aid.

O. K. CAMPBELL.
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HOWARD T. DUNKLIN. *The Prevention of Failure in First-grade Reading.* New York: Bureau of Publications, Teachers College, Columbia University, 1940, pp. 111.

Reading instruction which is adjusted to the abilities and needs of failing children usually is successful. Such success suggests that these failures might have been avoided if the reading instruction had been as well adapted to the requirements of the individual as the remedial program. Is it possible so to teach primary reading in typical public school classes as to make failure improbable? Obviously, the classroom is not as well adapted to individual diagnosis and instruction as the remedial clinic, but neither has the beginning reader in the classroom developed emotional attitudes toward reading.

The characteristics of an adjusted program were determined by examination of the literature relating to primary reading. Such a

program included recognizing and providing for individual differences in children's initial status of reading readiness and knowing their status in reading continuously throughout the period of instruction. Thus a type of reading experience which would engage the child's interest and effort and lead to success was provided.

The tentative program so established was tested out in public school classes in a rather well-controlled experiment, using as subjects those pupils who showed poorest ability in a learning-to-read test, and who, therefore, were most likely to be reading failures. The average achievement of the experimental group was clearly superior on all tests to that of the control group. The normal grade score for the final month of the first grade was 1.9. The experimental group met this standard with all average grade scores at 2.0 or above. The control group failed to meet this standard, with all average grade scores, except for oral reading, at 1.7 or below. These results clearly indicate that it is possible for the average schoolteacher to prevent many reading failures by use of adjusted instructional techniques. Failures in primary reading as indicated by non-promotion from the first grade constituted only seventeen per cent of the experimental group, as against sixty-one per cent of the control group.

In the literature of a field replete with techniques for remedying reading failures, it is encouraging to find a treatise concerned primarily with the more fundamental problem of preventing failures. The data reported here do not warrant the prediction that equal success might be achieved in all such instances. Nevertheless, it is evident that increased attention to adjusting the primary reading program to the needs of the child will produce worth-while results in decreased failures.

The reviewer objects to the distinction apparently made between factors of physiological maturity as causative factors of reading defect and other factors producing constitutional limitations. This is a distinction without adequate basis in experimental fact, and serves only to becloud the issue of reading readiness. The monograph would be of more value to the teacher planning to use such a program if a bibliography of materials for use with beginning classes were included. The merits of the monograph, however, are such as to warrant the serious consideration of all educators and research workers concerned with the improvement of primary reading instruction.

KENNETH E. CLARK.

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WILLIAM F. CUNNINGHAM. *The Pivotal Problems of Education.* New York: The Macmillan Co., 1940, pp. 588.

The author considers this text best adapted for use in the philosophy of education, but also suitable for courses in principles of education. The four pivotal problems are listed as: The pupil, the curriculum, the teacher, and the institution. It is obvious from the discussion of these points that the author has an intimate knowledge of educational theories, systems and practices. He is rightly critical of weaknesses and ineffectual results in contemporary education. Constructive suggestions which promise more adequate progress are given. There is sound emphasis upon education of the teacher rather than upon teacher-training, upon the implications of individual differences for education, and upon need of vocational and educational guidance.

The author's psychology is derived largely from philosophy and church psychology. Free will is upheld and there is an unconvincing attempt to belittle determinism. Hutchins, Adler, and Newman are frequently cited in support of the author's educational views. In general, the discussion is tied in with current views in Catholic education.

This treatise is stimulating in many ways. Nevertheless, since the background from which it is derived is rather strictly religious, the book will appeal to few except those engaged in Catholic education.

MILES A. TINKER.

University of Minnesota.

JOSEPH F. FOLSOM. *Youth, Family and Education.* Washington, D. C.: American Council on Education, 1941, pp. 299.

This is a report on the education of youth for parenthood. Special sections were contributed by Winifred E. Bain and Ellen Miller. Part I, consisting of four chapters, is largely an historical résumé of the changing social objectives of education. While agreeing that literacy and a vocational preparation still remain the fundamental goals of education, the author calls special attention to the need for more intense educational training in equally important non-vocational fields designed to produce better citizens, promote more congenial social inter-relations, improve physical and mental health, and reduce inter-familial conflicts.

Present-day educational approaches to these objectives and future recommendations at the nursery school, high school, college and community level are summarized in Part II. Two excellent features are an appendix listing organizations and journals concerned with family health and an annotated bibliography on such topics as personality and child development, marriage and the family, and sex education.

The style is interesting, amusing and quite informal. Anecdotes, casual comments and scientific reports are all combined to make a very readable and informative volume.

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